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# A Late Neolithic Palisaded Enclosure at Marne Barracks, Catterick, North Yorkshire

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*An open-area excavation conducted in advance of development at Marne Barracks, Catterick, in 2004 identified a relatively rare Late Neolithic 'palisaded' enclosure and other features. Approximately 55% of the enclosure was exposed. It consisted of two concentric sub-circular palisades with diameters up to 175 m and 200 m respectively. Each palisade consisted of a double circuit of posts, with the posts being* c. *1 m apart from centre to centre. Many of the posts on the western side of the monument had been sufficiently carbonised for the remains of individual posts to be identifiable. Twenty-one radiocarbon ages were determined and Bayesian modelling has produced a date estimate of 2530–2310 cal* BC *for the start of construction of the monument. This date matches well with new dates for the construction of Silbury Hill, the appearance of Beaker pottery in graves, the Amesbury Archer, and the timber circles at Durrington Walls, for example.*

*The Marne Barracks monument exhibits significant differences to other known examples of this type, and is in some respects unique. In particular the 'paired post' arrangement of a double circuit of posts in each palisade is unparalleled in any other known example. The apparent width of the entrances to the Marne enclosure is also at variance with other known sites, though this may in part be an artefact of post-depositional survival. The monument sits in a ritual landscape and, like a few others of its type, is close to water and a hill or large mound from where the activities taking place within the enclosure might have been observed. Do the nearby hill, the entrances, and the arrangement of the uprights all relate to control of physical and visual access into, or out of, the monument?*

*A number of broadly contemporary monuments, all within 5 km of Marne Barracks, contribute to a significant Neolithic ritual focus on the River Swale gravels. The complex of cursus and henge monuments at Thornborough and the henges at Nunwick, Hutton Moor, and Cana Barn all lie less than 25 km to the south, in the Swale-Ure interfluve.*

## PROJECT BACKGROUND

Following the ending of the cold war, the Royal Air Force station at Catterick in North Yorkshire was identified as being surplus to requirements. At the same time the Army was seeking extra accommodation in the Catterick area for units withdrawn from Germany. The station was therefore transferred to Land Command in 1994 and renamed 'Marne Barracks'. In 1999 the Ministry of Defence (MoD) commissioned an Establishment Development Plan (EDP) for the Barracks, to guide its long-term expansion and redevelopment. A key recommendation of the EDP was the need to undertake a programme of non-intrusive and intrusive archaeological investigations, which Archaeological Services Durham University were commissioned to undertake in 2000–2 (Archaeological Services 2001a; 2001b; 2002).

In 2003 a planning proposal was submitted for the development of a large area of the former airfield for accommodation blocks for service personnel. Part of this area had already been assessed as being of high

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archaeological potential due to the presence of Bronze Age, Iron Age, and post-medieval ditches, its proximity to a scheduled monument, and the depth of burial of the old ground surface during landscaping of the airfield in the 1930s (Archaeological Services 2002). It was recognised that the proposed development had the potential to disturb significant archaeological remains, even though the presence of the Neolithic enclosure was not known at the time, and since further development of the site might be requested in due course the MoD requested full archaeological excavation of the entire 11 hectare development area rather than just the footprints of the proposed new buildings. Archaeological Services Durham University undertook the excavation in September–November 2004.

## LOCATION, TOPOGRAPHY AND GEOLOGY

Marne Barracks is situated immediately south of Catterick village in North Yorkshire, bounded to the west by the A1(T) road and to the east by the River Swale (Fig. 1). The 2004 excavation covered an area to the north-east of the former runway centred on NGR: SE 2510 9695.

The land within the barracks is predominantly flat with a mean elevation of *c*. 53 m aOD. An exception to this is Castle Hills to the north-east of the development site, a low natural hill modified by earthworks so that it raises *c*. 15 m above the surrounding ground level. The general flatness of the area has been accentuated by levelling of the airfield during the 1930s. Cut and fill operations were used to create a more level surface for an improved runway; this involved the ground being reduced by up to 1.5 m over the western end of the development site and over a slight ridge in the east, and being raised by up to 1.5 m over the remainder (Archaeological Services 2001a). This artificial raising of the ground surface assisted in the preservation of archaeological deposits over much of the site.

The local geology comprises Carboniferous Millstone Grit, which is typically overlain by river gravels except around Castle Hills. The 'hills' are composed of boulder clay; a limited area of glacial sands and gravels is present immediately to their west and alluvium is present along the river to their east.

## ARCHAEOLOGICAL BACKGROUND

Catterick lies on a crossing of the River Swale close to the northern end of the Vale of Mowbray. North of the river the ground rises to the prominent gap between the Pennines and North York Moors at Scotch Corner. The village and surrounding area is in a strategic location and consequently has a complex and varied history. The earliest evidence for human presence comes from a limited quantity of Mesolithic and later flint and chert found at Brough St Giles (Cardwell & Speed 1996) and also in fieldwalking as part of the A1(M) evaluation (Makey 1994). A knapping floor of similar age was found during the 2004 excavation and is described elsewhere (Archaeological Services 2006).

Slightly later in date, a Neolithic cursus and Late Neolithic/Early Bronze Age ring-ditches and pit alignments are known from Scorton (Topping 1982; GeoQuest Associates 1997; Wessex Archaeology 1998a; 1998b; NAA 2000); a huge Late Neolithic/Early Bronze Age chambered cairn and possible henge has been excavated at Catterick Racecourse (Moloney *et al.* 2003); and a possible Bronze Age stone-filled ring-ditch to the south of the runway at Marne Barracks was discovered and sampled in 2001 (Archaeological Services 2002). Later prehistoric remains include Iron Age settlements at Catterick Racecourse (Moloney *et al.* 2003) and Brough St Giles (Cardwell & Speed 1996).

The historic periods are also well-represented in the immediate area, including a Roman fort at Catterick Bridge constructed in *c*. AD 80, around which developed the town of *Cataractonium*. Civilian settlement spread to both banks of the river and south along Dere Street and within the western limit of Marne Barracks (Wilson 1984; 2002; Archaeological Services 2005). A substantial Roman building, possibly part of a villa complex and Romano-British field systems are also present (Hildyard 1955; Wilson 1984; 2002; Geoquest Associates 1994; Wilson *et al.* 1996; Archaeological Services 2002; 2005). A major volume has recently been published on Roman Catterick (Wilson 2002).

Catterick remained an important site throughout the early medieval period with royal marriages and baptisms taking place there (Cosgrave & Mynors 1969; Whitelock 1955; Wilson *et al.* 1996). Anglo-Saxon sunken-featured buildings have been found, including under the REME workshop at Marne

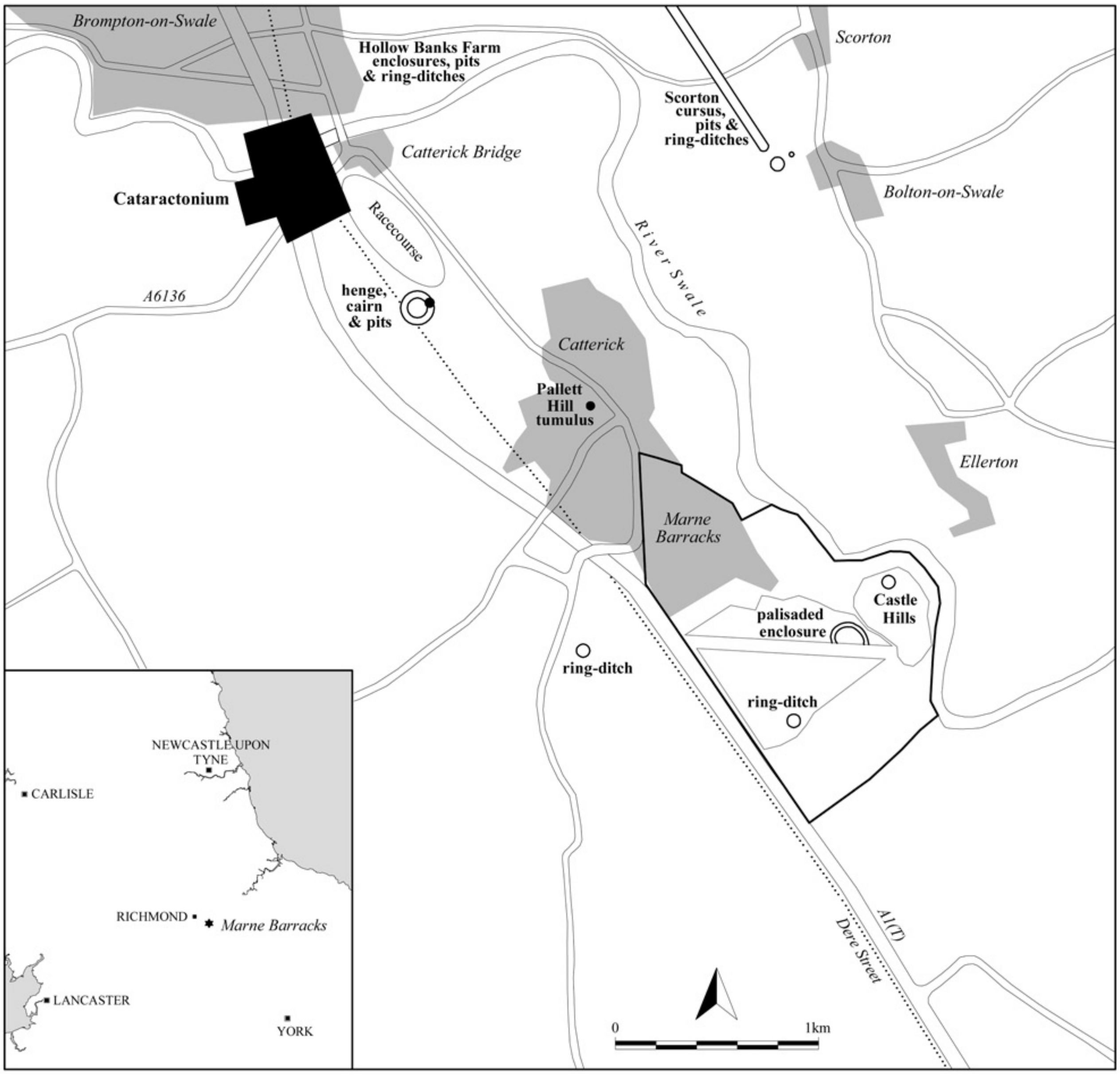


Fig. 1.
Site location and nearby Late Neolithic/Bronze Age monuments

Barracks (Geoquest Associates 1994) and numerous burials (Wilson *et al.* 1996).

The earthworks on Castle Hills are scheduled as a Norman motte and bailey castle on morphological grounds, however a number of authors (eg, MacLauchlan 1849; Wilson *et al.* 1996) have suggested that the site has a more complex history with earlier remains being present as well. A topographic survey in 2000 recorded features which did not appear to be contemporary with the castle, although the date of these is not known (Archaeological Services 2001a).

Former ridge and furrow cultivation is clearly visible on the geophysical survey of the airfield

(Archaeological Services 2001a; 2002) while the earliest detailed plan of the parish, dated 1739, shows a field pattern little different to that of today (Archaeological Services 2001a). A Royal Flying Corps unit was posted to Catterick in 1916. During the late 1930s the runway was extended and hardened, involving considerable landscaping.

## THE EXCAVATION

The 2004 excavation covered an area of *c.* 11 ha to the north-east of the former runway (Fig. 2). Stripping of topsoil and infill from the 1930s landscaping was carried out from west to east with the archaeological team following behind the machines. Since the palisaded enclosure lay at the eastern end of the site, it was not exposed and identified until late in the excavation programme.

### *The enclosure*

A large sub-circular enclosure was identified at the eastern end of the development area, consisting of two concentric, sub-circular palisades (Fig. 3). Both were slightly more than half exposed; the southern part of the monument lay under the runway, and probably beyond, and was not investigated. During earlier evaluation work, part of the inner circuit had been detected as a very weak geomagnetic anomaly, interpreted as a possible ditch and targeted by trial trenching. Unfortunately the trench location proved to be within the northern entrance to the enclosure, where an anomaly associated with a later silt deposit falsely suggested a continuation of the palisade anomaly. Consequently the presence and nature of the monument was still not determined at that time.

With the benefit of hindsight it is also possible to trace part of the western side of the outer circuit in the geophysical survey. Two curvilinear magnetic anomalies recorded to the south of the runway are on an alignment that suggests they could be the southern extent of this feature (although this has not been proven by excavation). Assuming that this is the case then the approximate dimensions of both palisades are given in Table 1.

Each palisade was composed of a series of radially-aligned slots approximately 2 m long and just under 1 m wide. They were spaced 1 m apart from centre to centre, leaving a very narrow gap (typically less than 0.1 m) between each slot. This pattern can be seen particularly well in aerial photographs (Fig. 4). Approximately 75 slots in each palisade were planned in detail (about 30% of the total identified) and the extents of the remainder of the palisades were recorded. Most slots were an elongated oval in plan, although some were dumbbell-shaped and others were visible as two discrete post-holes on the surface (Fig. 5). Upon excavation, all slots resolved at depth into two radially-aligned post-holes, each one approximately 0.5 m in diameter and between 0.5 m and 1.25 m in depth, with a half-depth lip between them. Variations in plan were superficial and probably related to the degree of truncation.

A number of these post-holes contained *in situ* charcoal fragments from former posts. Such remains were particularly concentrated around the western side of the monument, with charcoal from many posts in the inner circuit and some in the outer one surviving (Fig. 6). Elsewhere posts were only intermittently preserved by this method. Usually charcoal only survived to around half the depth of the post-hole. In some slots the gravel surrounding the posts had a pinkish tinge due to heat-alteration of the surrounding fill. Where the carbonised remains of posts survived, they were round in plan and almost invariably 0.2–0.3 m in diameter, giving a

TABLE 1: DIMENSIONS OF THE ENCLOSURE

| | *Inner Palisade* | *Outer Palisade* |
|---|---|---|
| Long axis | 175 m | 200 m |
| Short axis | 136 m | 162 m |
| Perimeter | 480 m | 610 m |
| Perimeter (exposed) | 262 m (55%) | 330 m (54%) |
| Area | 1.8 ha | 2.75 ha |
| Area (exposed) | 0.98 ha (54%) | 1.8 ha (58%) |

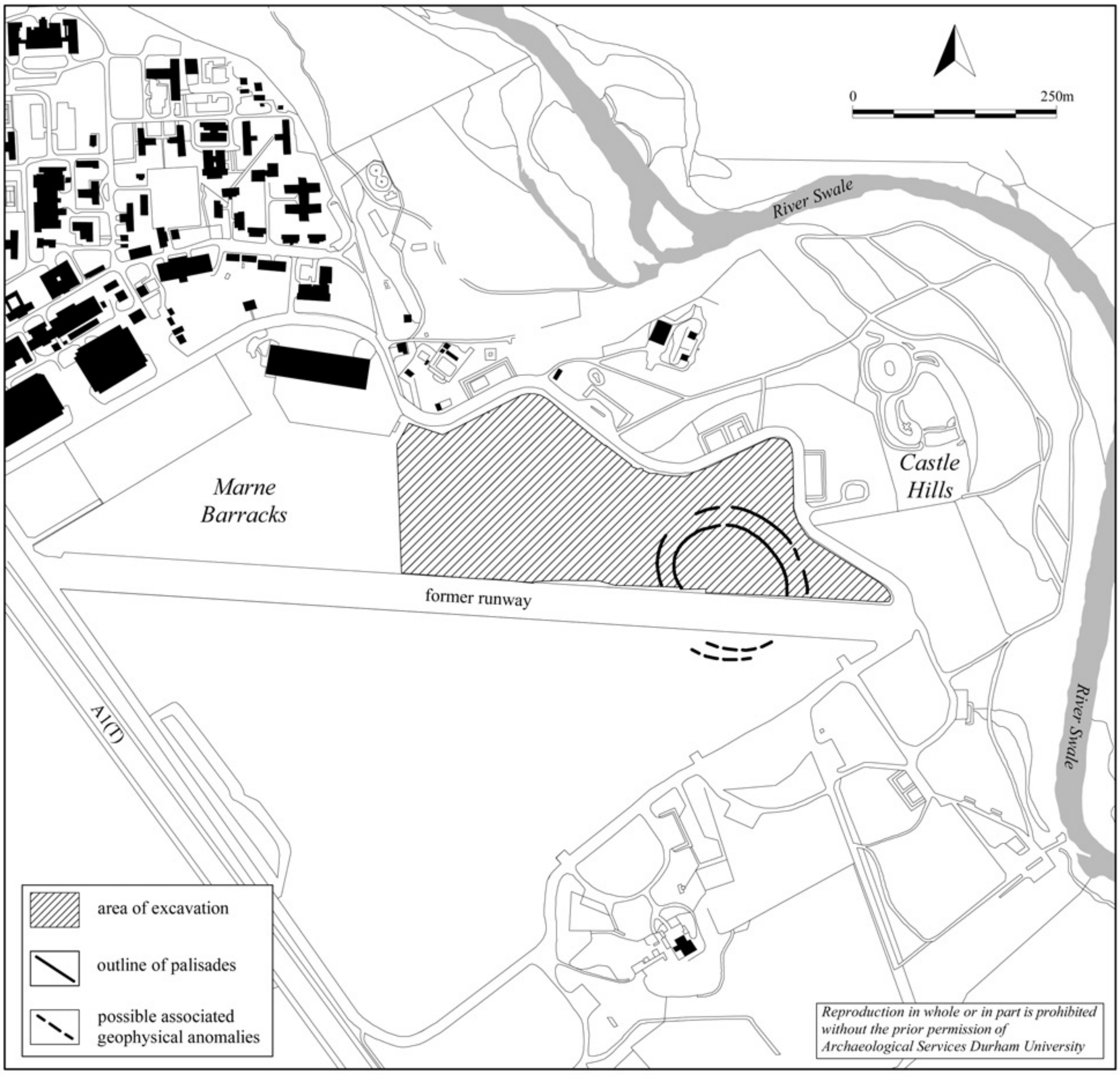


Fig. 2.
The 2004 excavation and palisaded enclosure

considerable degree of uniformity to the appearance of the original structure. The great difference between the width of the post-holes and their associated posts is likely to be partly due to the practical consideration of obtaining sufficient working space during their original excavation and partly due to collapses during the original excavation of the holes. The low lip between the two post-holes in each slot was probably also a practical measure to allow access for the excavation of the bottom of the post-holes.

Little evidence was seen for post-pipes in the slot fills outside the areas of carbonised remains. This was probably due to the loose nature of the surrounding gravel fills, causing the voids left by the rotting posts to be filled by subsidence of the slot backfill rather than by infill with extraneous material. A number of

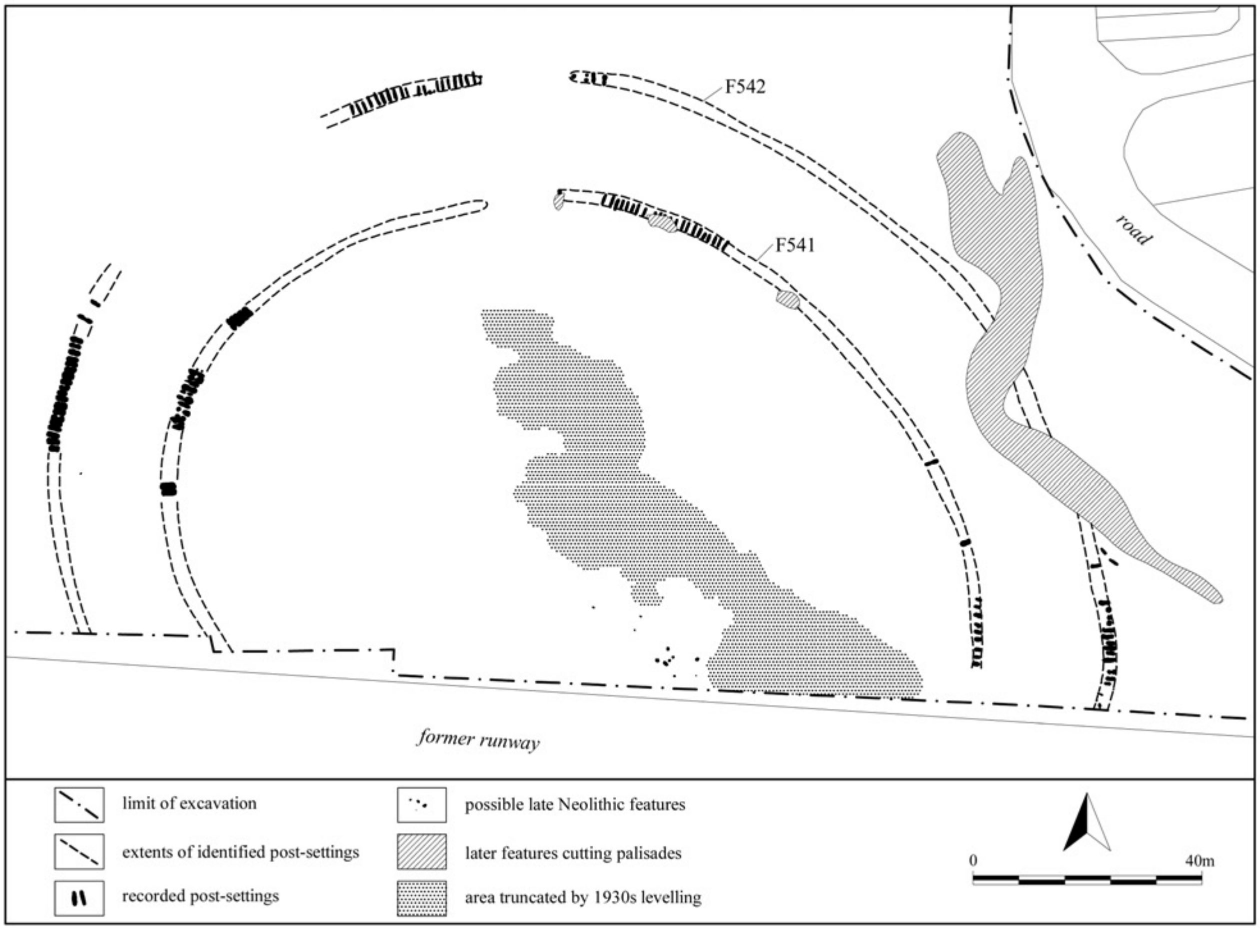


Fig. 3.
Plan of palisaded enclosure

the post-holes had shallower profiles on their outside edges than on their inside ones, particularly towards the top of the hole (see for example Fig. 11, slots [F872], [F873], and [F604]). Post-ramps were probably a deliberate design feature to facilitate the erection of the post. Several adjoining slots contained the same fill (eg, [F634]/[F635], [F569]/[F670]) indicating they were backfilled simultaneously. However, others exhibited intercutting relationships, with the cutting sequence either running in a clockwise direction (eg, [F569] cutting [F536]) or else in an anti-clockwise direction (eg. [F673] cutting [F550]). This suggests the construction sequence was rather *ad hoc*, with people working in both directions simultaneously.

Twenty-three radial slots in the outer palisade and 25 slots in the inner palisade (approximately 10% of the total identified) were sampled by excavation. To maximize the information potential, a variety of sampling strategies was adopted. Individual slots were sampled either longitudinally or laterally, and for some slots just the posts were examined while for others the whole slot was excavated. Sampling was deliberately biased towards the western side of both circuits since this area contained the greatest number of visible, carbonised post remains and was also the area of best preservation. The loose nature of their fills meant that excavation of some slots had to be

Fig. 4.
The Palisaded enclosure from the air © English Heritage

abandoned before completion.

For two circuits are described below by area of excavation, proceeding clockwise in each case from west to east. For ease of reading, area plans and post-hole sections have been placed at the end of the text in Appendix 1 (Figs 10–23); dimensions of the radial slots for each circuit are given in Appendix 2.

*The outer palisade [F542]*

The south-western part of the outer circuit was not visible on the ground surface in typical light conditions, largely because of a lack of carbonised post remains. However, in favourable conditions it could be traced continuously in a clockwise direction for 32 m from the runway, to a point where burnt

Fig. 5.
Radially-aligned slots before excavation, each containing paired-posts

fragmentary carbonised remains of two posts. In slot [F506] a differentiation could be made between the general slot backfill [504] and the gravels [515 & 516] under the carbonised remains of the posts themselves [503 & 505]. The next three excavated slots [F615, F507, & F872] were typical in form. In the next excavated slot [F604], as with slot [F506], the gravel [607 & 605] surrounding the post remains [608 & 606] had a pinkish hue, probably due to heat-alteration, and could be differentiated from the general slot fill [609]. In slot [F873] only the remains of the outer post [778] were evident. The fill of the inner post-hole [780] could not be distinguished from the general slot backfill [777].

Slot [F487] (Fig. 12) was typical in form. The next identified slot [F869] was only excavated to a depth of 0.75 m because of the instability of its fills. The dimensions given in Appendix 2 are therefore minimum values. The fill of the next identified slot [F882] was even more unstable, causing the section to collapse before it could be properly recorded; carbonised remains had been present in both its post-settings and the holes themselves were at least 0.9 m deep.

To the north of slot [F882] there was a gap of 45.2 m in the enclosure where radial slots were not observed under any lighting or drying conditions. This is likely to be due to poor visibility of the features in this area rather than to a real break in the circuit since post-holes became more common and visibility of the feature improved. Here slot [F574] (Fig. 10) was excavated longitudinally and proved to be a typical slot with the fragmentary remains of two carbonised posts [544 and 546] evident. Beyond an unexcavated slot, the next two were sampled laterally. No post-pipe was visible within slot [F828] although a 'post' survived in slot [F570]. Slot [F867] contained two post-holes filled with reddish-brown gravels [639 & 624] surrounded by a more yellow gravel [668]. Little charcoal was present in either and the 'post-fills' identified were far wider than the post remains identified in other slots, suggesting that these contexts were the limits of heat-alteration of general slot fill [668] rather than post-pipe fills. Slot [F594] was not fully excavated due to the instability of the fill so the depths given in Appendix 2 are minimum values.

Slot [F868] (Fig. 11) was typical and contained the

Fig. 6.
Cross-section of one radial slot and its two post-holes

the inner circuit was complete here, even though it could only be traced in exceptional light and drying conditions, as on the day that aerial photographs were taken (see Fig. 4). The poor visibility was partly due to the fact that the area of carbonised post remains finished at this point. Beyond this apparent gap the typical sequence of radial slots was visible again (Fig. 13), though most were not excavated. Slot [F428] had been heavily disturbed by a tree root and was therefore not fully excavated.

At its northern extremity, there was a 16.5 m wide gap in the outer palisade. Since this lined up with a similar gap in the inner palisade, and post-holes to either side were not significantly truncated, this is thought to have been an original entrance to the enclosure. The western side of this entrance was not marked by any variation from the normal pattern of radial double-posts, other than the fact that the two easternmost posts were not within a slot (although it should be noted that the feature was very poorly defined at this point). Towards the east, however, the palisade began again with a single large post-hole [F839] (Fig. 14) that was centrally placed, as opposed to the normal double-post arrangement. Beyond this single post, the sequence of double-posts began again, though the first pair of post-holes ([F862] & [F864]) were not within a slot. No charcoal was observed in either and both were filled with gravel. Eastwards from this were two more typical radial slots, [F437] and [F689]. In suitable lighting and drying conditions the circuit could be traced eastwards from this point for a further 80 m until it was obliquely cut by a Romano-British ditch. It was visible again beyond this ditch as a clearly-defined slot [F831] containing two post-settings, each 0.6 m deep, although no evidence for the posts survived either as charcoal or as a change in fills. Outside the enclosure at this point were two features [F715 & F717] that resembled slots in plan but were oriented parallel to the enclosure. They were similar in size and fill to the nearby slots although, on excavation, neither proved to contain post-holes. Both were pits, 0.2 m deep, and their relationship to the enclosure is unknown.

Southwards from here, the radial slots became poorly defined again due to the very mixed nature of the natural gravel. However, on one occasion, with exceptional lighting and drying conditions, they became visible for a few hours. Further south again, carbonised wood fragments were evident and the natural gravel became less variable in nature, making the post-holes and slots easier to identify. The normal pattern of radial slots continued until a point 5 m north of the runway (Fig. 15). Here a smaller than typical slot [F855] was slightly offset inwards from the line of the palisade. A second entrance began beyond this point. After a 2 m gap, there was another even smaller, although otherwise typical, radial slot [F844] containing carbonised fragments of two posts ([845 & 846]). Half a metre south from this, and separated from each other by a half-metre gap, were two former stakes ([847] and [848]), both surviving in carbonised form. These were 0.11 m and 0.08 m in diameter respectively, and 0.13 m and 0.12 m deep, and had been driven into the ground rather than dug in. Half a metre further south, feature [F853] was exposed along the southern baulk of the excavation. This appeared to be another small radial slot, similar in size to [F844], containing carbonised post remains [850] at its southern end; however, the charcoal survived as very small specks rather than as recognisable flecks.

### *The inner palisade [F541]*

This circuit was clearly visible both as a soilmark and as a double line of carbonised posts for a continuous distance of 110 m north and east from the runway (see Fig. 5).

Adjoining slots [F635 and F634] (Fig. 16) were the best-preserved examples investigated. Since the natural gravel at the base of these contained a band of pure sand, markedly different to the gravel fills, measurements from these slots have a particularly high degree of certainty. Both were filled by a lower darker gravel [633] and an upper reddish–brown sandy gravel [631], perhaps indicating that they were infilled concurrently. Slot [F635] contained an outer post-hole 1.1 m deep and an inner one 0.85 m deep, while slot [F634] contained an outer post-hole 1.25 m deep and an inner one 0.8 m deep. Fragmentary carbonised remains of three of the four posts survived to depths between 0.35 m and 0.4 m, though post [513] only survived to a depth of 0.1 m.

Further north, slot [F530] (Figs 17 & 18) collapsed twice during excavation due to the very loose nature of its fill [529] and could not be fully excavated and recorded; the dimensions given in Appendix 2 are minimum values. The next three slots [F881, F880, & F879] all consisted of two discrete post-holes from the surface, rather than slots resolving into post-holes at depth. No carbonised remains were present in any of them and no post-pipes were evident. Slot [F673] only contained carbonised remains of its inner post [672] while slot [F550] contained no carbonised post remains. A stratigraphic relationship could be determined between these two slots, with [F673] cutting [F550]. In slot [F581] the carbonised remains of both posts leaned at an angle of approximately 20° from vertical. This is likely to be due to subsidence following construction rather than an original design feature since no other posts in the monument exhibited this inclination. Slot [F811] contained more-typical vertical posts. The natural gravel was particularly loose around slot [F536], causing the excavated section to collapse before recording was complete, so the dimensions given for this slot in Appendix 2 should be regarded as approximate. It was cut by slot [F569] to the north. Only the inner half of [F569] was excavated, although the carbonised remains of an outer post were recorded in plan. Although this example could be seen to cut slot [F536] to the south there was no evident relationship with slot [F670] to the north, both being filled with identical gravels. As with slot [569], the outer post was not excavated in [F670], although charcoal post remains were visible and plotted on plan. Only the carbonised post remains were excavated in the next three slots [F874, F877, & F878]. Slot [F565] was also not fully excavated due to the looseness of the gravel fill [564] so its measurements are also minimum values.

The next visible slot [F666] (Fig. 19) was sectioned longitudinally and proved to be of typical construction. Only the carbonised remains of the posts were excavated in the next slot [F875]. Two further typical slots ([F494 & F531]) were also excavated in this area. For a distance of 25 m beyond this point the palisade circuit was only visible in exceptional conditions, as a result of the mixed nature of the surrounding gravel and the lack of carbonised remains. Beyond this, there were a few slots where only the remains of inner posts were visible and then an area disturbed by later deposits where the circuit was not at first observable. A JCB was used to strip further soil here and exposed radial slots across most of the area with the exception of a 14 m gap in line with the gap in the outer palisade. To test whether this was an original design feature or due to truncation of deposits, a section was excavated through the slot on either side. To the west of the gap, the inner post-hole of slot [F842] was 0.6 m deep while the outer post-hole of slot [F858] to the east of the gap was more than 0.75 m in depth (its base was not reached). The surviving depth of these two indicates that truncation of deposits could not explain this gap in the palisade. It lies directly in line with a similar gap in the outer circuit that also could not be explained by truncation of deposits and is therefore regarded as an original entrance to the enclosure. No evidence was found for any contemporaneous features within the entrance, however, it should be noted that the natural gravel here was very dark in colour (due to manganese staining) and was also disturbed by later features; stake-holes or other slight features (such as were found in the eastern entrance to the outer palisade) would not have been clearly visible here.

Eastwards from the entrance, a continual line of radial slots (Fig. 20) could be traced for a distance of 86 m as far as slot [F727] (Fig. 21). Both posts in this slot contained charcoal extending to the full depth of the post-holes, with more charcoal at depth than on the surface. A similar situation was found in slot [F705] (see below) but was not seen elsewhere in either palisade. This was probably a result of a change in the local geology from gravel to sands and clays.

Sixteen metres to the south, beyond a number of poorly visible slots, there was a short section where pairs of carbonised posts were visible on the surface. At the northern end of these, slot [F705] (Fig. 21) contained an outer post-setting 0.75 m deep and an inner one 0.9 m deep. As with slot [F727], carbonised remains of the posts (outer post [697] and inner post [698]) survived to the full depth of the holes. These were surrounded by a lower grey clay [734] and an upper orange–brown silty clay [706]. Beyond these carbonised remains, slots became increasingly difficult to identify and could not be determined at all from a point 9 m from the runway (Fig. 22). Since this lined up with the clearly-defined eastern entrance to the outer palisade, this may represent a real break in the circuit at this point rather than an apparent one.

*Features within the enclosure*

Twelve post-holes were exposed within the enclosure, approximately at its centre (Fig. 23). These did not form any identifiable pattern and no dating evidence was obtained from any of them, so it is not known whether they are related to the structure or not. They have been included in this report on the strength of their location within it. All were less than 0.7 m in diameter and less than 0.5 m in depth. Six formed a tightly clustered central group within 1.5 m of each other with [F661] cutting an earlier one [F663]. Three of the other post-holes were situated a few metres to the south-east while the other three were further to the north-west. It should be noted that all these post-holes lay along the south-western edge of a ridge of higher ground which had been machined off during the levelling of the airfield in the 1930s. This former ridge is evident as a band of lighter gravel in aerial photographs and is shown on Figures 10–23. The post-holes are likely to have been truncated and there is potential for further post-holes towards the north-east to have been completely removed by this levelling. In addition, a small pit [F648] was identified between the inner and outer palisades on the western side of the monument. Its fill contained a few fragments of calcined bone although insufficient was present for it to have been a complete cremation burial.

### *The finds*

Two flint flakes and four chert flakes were recovered from slot fills during the excavation. The chert was probably residual, derived from a Late Mesolithic/Early Neolithic knapping floor located between the inner and outer palisades in the north-east quadrant of the enclosure (Archaeological Services 2006). A total of 1180 pieces of chert were recovered from the knapping floor, but since none was found elsewhere the pieces from the enclosure post-slots are likely to be redeposited. Flint was not present in this assemblage and only eight pieces were recovered from the whole excavation. Two flint flakes were present in the fill of the inner post-hole of slot [F437], just to the east of the north entrance of the outer palisade. Unfortunately neither flake is diagnostic but their location close to an entrance could be significant. Three other flint pieces, a blade, and two flakes, came from the fills of a Romano-British ditch 60 m to the north-west and are presumably redeposited. Given the general lack of flint across the site, the concentration of finds in this area may be significant.

One other find was potentially significant: a sandstone cobble from a large pit [F597] which cut the inner palisade immediately south of the knapping floor. The cobble measures 164 x 144 x 92 mm and is D-shaped in section, with a rounded base and an almost flat top. It has a central deep-pecked hollow (54 x 59 x 14 mm deep) and a second incipient pecked area (25 x 23 x 2.5 mm) on the flat surface. The main hollow has well-defined peck marks of *c.* 2–3 mm diameter; its regular shape suggests it was manufactured rather than arising from wear. This was the only find from the pit, which post-dates the enclosure but is otherwise undated. A number of conflicting interpretations have been suggested for this object: first, the stone may have been a Mesolithic anvil stone with the apparent cup-marking being a consequence of its use for knapping small flint pebbles (M.J. White, pers. comm.). In this case the shape would allow the stone to be bedded into the ground in use, while the incipient marks beside the main hollow suggest wear arising from use. Similar 'cup-marks' have been found on other Mesolithic working floors in Scotland and northern England and are associated with the knapping of small, river-worked flint pebbles. The discovery of this object near the knapping floor (albeit in a later context) may support this suggestion. Secondly, the hollow had perhaps been designed as a receptacle for pounding or grinding functions; a mortar for grinding pigments or a knocking stone for dehusking barley (F. Hunter, pers. comm.). As with the former interpretation, its shape would allow it to be bedded into the ground when in use. Thirdly, the hollow had perhaps been deliberately created to form a portable cup-marked stone for ritual use (M. Diaz-Andreu, pers. comm.). Might the object have been used ritually during the lifetime of the monument, and/or placed in the pit after the upright posts had gone as part of a 'closure' ritual?

Although a large number of environmental samples were collected from slots in the enclosure and from the unphased post-holes in its centre, environmental evidence was limited. Most samples contained only charcoal, presumably from the burnt posts. The only charred macrofossil was a *Plantago lanceolata* (ribwort plantain) seed in [521], an inner post-hole of the outer circuit. Ribwort plantain may have been growing in an area of pasture or waste ground near the site. The prehistoric phases of the site were characterised by a general lack of pottery and bone. Full details of the environmental investigations are available in the archive report.

### *Radiocarbon dating and Bayesian analysis*

Twenty-one radiocarbon dates were obtained from single charcoal fragments recovered from post-holes in the palisades. Wherever possible, charcoal samples were collected *in situ* from the outer edge of the post remains, though seven were recovered from the flotation of post-hole fills. All the samples were oak and none was roundwood, the only possible exceptions being those from [566] and [616], which were too small to identify but which were also from post-holes in the palisades. Oak samples carry a risk of an old-wood effect, whereby the date of growth of the wood in heartwood samples may pre-date their context by up to several centuries. To avoid this problem it is necessary to sample sapwood or bark, or failing that, as close as possible to the outside of the tree. However, sapwood is not reliably identifiable and while tyloses are an indication of heartwood, a lack of tyloses does not necessarily indicate sapwood (J.P. Huntley, pers. comm.). Thus, those samples from the outer edge of the charcoal remains found in the post-holes have minimised this risk but not removed it, whilst for those recovered by flotation there is less assurance of the date being close in time to the felling of the tree and thus to the construction of the monument. Table 2 shows all the dates with their calibrated ranges without any modelling. The sample from context [850] proved not to be of archaeological origin; the radiocarbon age may be due to a hydrocarbon residue from the adjacent runway.

The dates obtained have been analysed within the Bayesian paradigm (Buck *et al.* 1996). Bayes Theorem provides a logical framework for the modification of current beliefs in the light of new evidence. In a Bayesian analysis of a group of radiocarbon dates this allows the incorporation of stratigraphic and sample reliability information into a mathematical model, and also allows the estimation of probability distributions for events that have not been directly dated. All estimates of calibrated and modelled dates were made using OxCal 3.10 (Bronk Ramsey 1995; 2001) and the IntCal04 International Calibration Curve (Reimer *et al* 2004). OxCal's default settings were altered to work at one-year resolution with linear interpolation of the calibration curve and no rounding. Following the convention of Cleal *et al.* (1995, 6) calibrated radiocarbon dates derived from a model are given in italics, whilst dates derived from simple calibration of a single date are given in normal type. All results have been rounded outwards to the nearest decade.

In the analysis of the Marne Barracks dates, several different mathematical models were applied and compared, to allow for the varying levels of reliability of the samples. In each model a group of samples has been assumed to come from a coherent period in time with a start and end date that can be estimated from the radiocarbon dates. Models 1, 2, and 5 assume that this can be applied to all the dates from both palisades simultaneously, whilst models 3, 4, and 6 treat the dates from each of the palisades separately and examine their order of construction. Models 1 and 6 are illustrated in Figures 7 and 8. In models 1 and 3 the flotation samples are included, but as there is a distinct possibility that they are from inner parts of the trees used for the posts, they are treated as simply giving *termini post quos* for their contexts. In models 2, 4, 5, and 6 these samples are omitted. The status of the sample from context [394], which appears to be earlier than the other *in situ* samples, is also investigated by omitting it from the calculation and computing the probability of it belonging to the group of dates in models 5 and 6, but including it in models 2 and 4.

Table 3 shows the modelled results for the beginnings, ends, and durations of phases under the various models. This clearly shows that removal of the samples obtained by flotation and of the sample from context [394] has a pronounced effect on the results. In models 2 and 4, which calculate the probability of the context [394] sample fitting within the model, the probabilities are not low enough to definitively exclude this date, even though visual examination of the OxCal plots (Figs 7 & 8) suggests that it is earlier than the other dates from *in situ* charcoal. When it is included in models 1, 2, 3, and 4, OxCal reports perfectly satisfactory agreement indices, which indicate that it fits within those models. However it is the inclusion or exclusion of this one date that makes the biggest difference to the results. Without it, the duration of the overall construction, or of the inner palisade construction, is shifted to a shorter timespan, more consistent with archaeological expectations. Similarly the start of construction for the inner palisade, or of the whole structure, is shifted to earlier dates. It remains possible that the old-wood effect has increased the age of this sample.

In all the models examined the order of the end dates of the construction of the inner and outer post circuits cannot be reliably determined, with just 24–38% chance that the inner palisade construction finished before the outer one. Given the risks of small

TABLE 2: RADIOCARBON DATES AND CALIBRATED RANGES WITHOUT MATHEMATICAL MODELLING.

| *Context* | *Type* | *Material* | *Lab No.* | *Radiocarbon determination (BP)* | *Calibrated range (cal. BC 95.4% probability)* |
|---|---|---|---|---|---|
| *Inner palisade samples* | | | | | |
| 394 | Outer post | *in situ* charcoal | Beta-197192 | 4030±40 | 2840–2810 (3.0%)<br>2670–2460 (92.4%) |
| 511 | Outer post | flotation charcoal | Beta-211680 | 3960±40 | 2580–2340 (95.4%) |
| 532 | Outer pos | t*in situ* charcoal | Beta-211682 | 3780±40 | 2350–2120 (87.5%)<br>2100–2040 (7.9%) |
| 534 | Inner post | *in situ* charcoal | Beta-211683 | 3810±50 | 2460–2130 (94.3%)<br>2080–2060 (1.1%) |
| 560 | Inner post | flotation charcoal | Beta-211684 | 3730±50 | 2290–2010 (93.1%)<br>2000–1970 (2.3%) |
| 566 | Inner post | flotation charcoal | Beta-211685 | 3840±50 | 2470–2190 (91.1%)<br>2180–2140 (4.3%) |
| 576 | Outer post | *in situ* charcoal | Beta-211687 | 3900±40 | 2480–2270 (93.3%)<br>2250–2220 (2.1%) |
| 578 | Outer post | flotation charcoal | Beta-211688 | 3910±40 | 2490–2280 (94.3%)<br>2250–2230 (1.1%) |
| 592 | Inner post | flotation charcoal | Beta-211689 | 3750±40 | 2290–2030 (95.4%) |
| 610 | Inner post | *in situ* charcoal | Beta-211693 | 3780±40 | 2350–2120 (87.5%)<br>2100–2040 (7.9%) |
| 616 | Outer post | flotation charcoal | Beta-211694 | 3870±40 | 2470–2270 (84.4%)<br>2260–2200 (11.0%) |
| 697 | Outer post | *in situ* charcoal | Beta-211695 | 3890±40 | 2480–2270 (90.9%)<br>2260–2200 (4.5%) |
| 698 | Inner post | *in situ* charcoal | Beta-211696 | 3950±40 | 2580–2300 (95.4%) |
| 709 | Inner post | *in situ* charcoal | Beta-211697 | 3910±40 | 2490–2280 (94.3%)<br>2250–2230 (1.1%) |
| *Outer palisade samples* | | | | | |
| 573 | Inner post | *in situ* charcoal | Beta-211686 | 3910±40 | 2490–2280 (94.3%)<br>2250–2230 (1.1%) |
| 596 | Inner post | *in situ* charcoal | Beta-211690 | 3890±40 | 2480–2270 (90.9%)<br>2260–2200 (4.5%) |
| 603 | Outer post | *in situ* charcoal | Beta-211691 | 3850±40 | 2470–2200 (95.4%) |
| 608 | Outer post | flotation charcoal | Beta-211692 | 3750±40 | 2290–2030 (95.4%) |
| 751 | Outer post | *in situ* charcoal | Beta-211699 | 3810±40 | 2460–2370 (8.4%)<br>2360–2130 (87.0%) |
| 778 | Outer post | *in situ* charcoal | Beta-211700 | 3830±40 | 2460–2190 (91.7%)<br>2170–2140 (3.7%) |
| 850 | Post | *in situ* charcoal | Beta-211701 | >46,000 | – |

old-wood effects in any of the samples, and that 50% chance is to be expected if they are identical, the order cannot be resolved. The order of the start of construction of the two palisades is better resolved, but relies on the date from context [394] to give the higher probabilities that the inner palisade construction started before the outer one.

In conclusion, the timber circuits at Marne Barracks were constructed and used over a period of less than 460 years (Model 3 gives 210–460 years with 95% probability) and possibly in a time as short as a few decades (Model 5 gives 10–300 years with

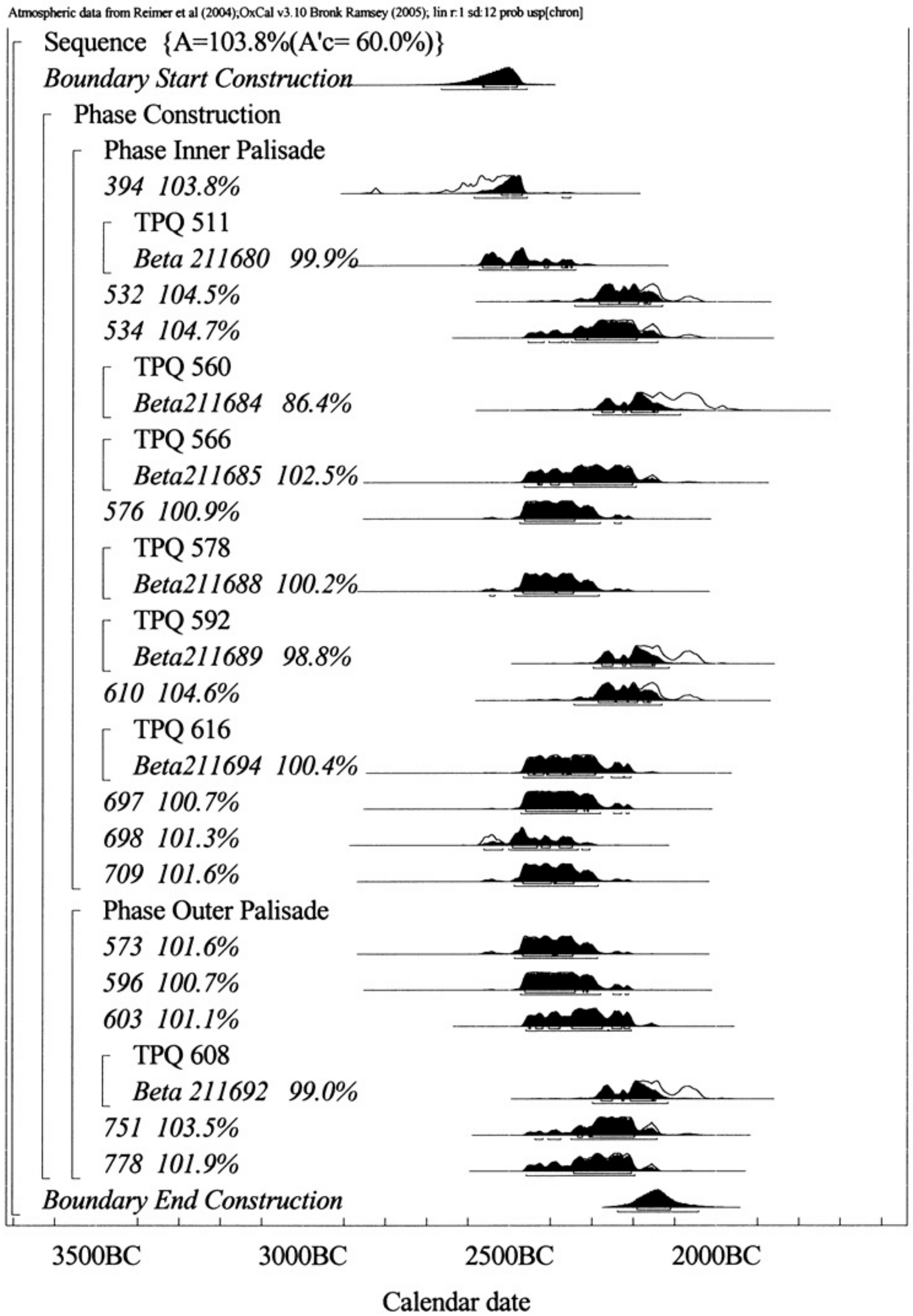


Fig. 7.
Calibration results from Model 1: all dates included in one construction phase. A probability distribution is shown for each date, in outline when calibrated independently and in solid black as modelled

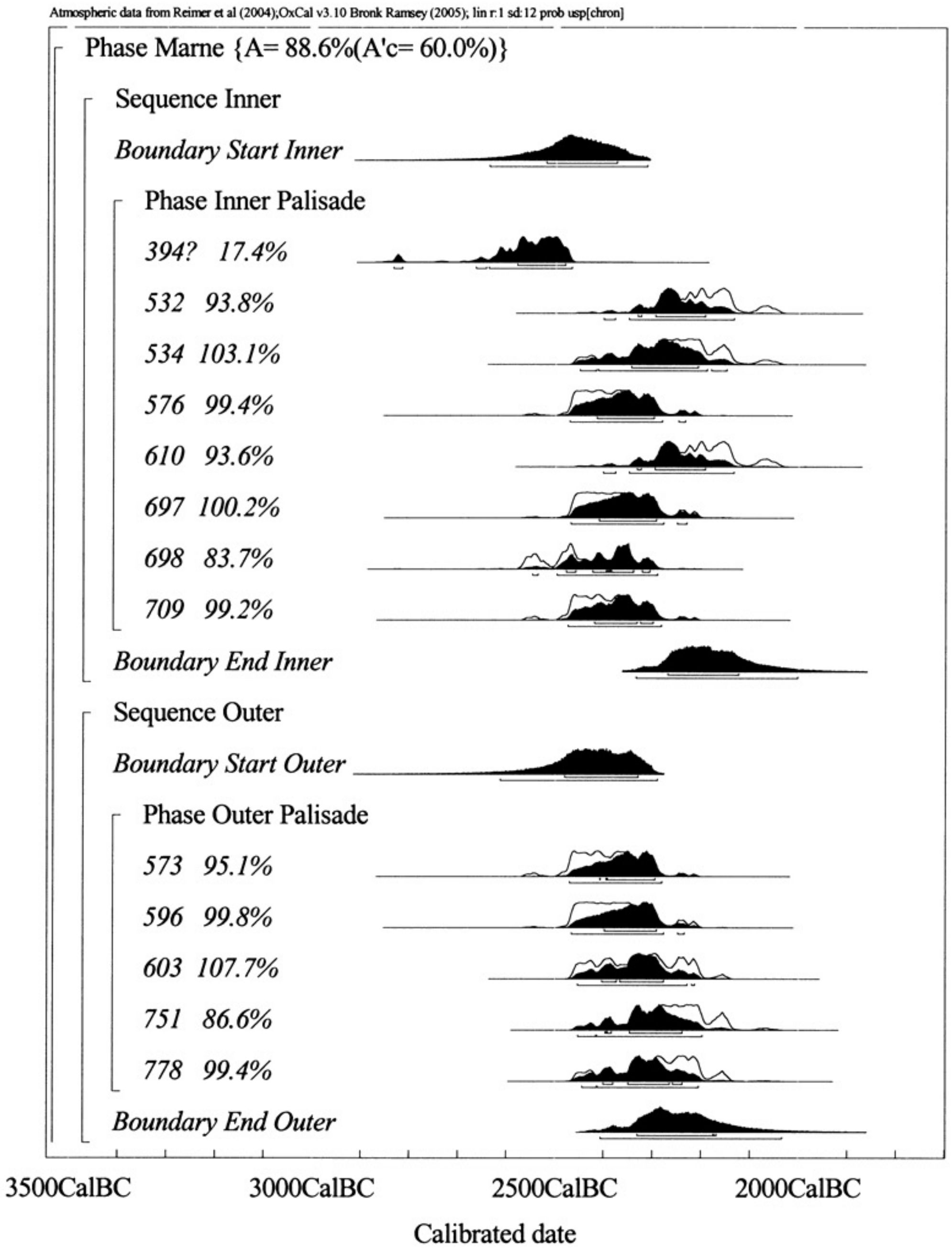


Fig. 8.
Calibration results from Model 6: using only *in situ* charcoal dates excluding context [394] and with separate construction phases for inner and outer palisades.

TABLE 3: START DATES, END DATES AND DURATION OF CONSTRUCTION PHASES UNDER DIFFERENT MODELS (ALL RANGES ARE 95% PROBABILITY HIGHEST POSTERIOR DENSITY REGIONS)

| | *Parameter* | *Using all dates* | *Using all in situ samples* | *Using in situ samples (exc. context 394)* |
|---|---|---|---|---|
| *Model* | | *1* | *2* | *5* |
| Single phase for all posts | start of construction | *2660–2460 cal. BC* | *2640–2450 cal.* | *BC2530–2310 cal. BC* |
| | end of construction | *2240–2040 cal. BC* | *2290–2070 cal.* | *BC2340–2100 cal. BC* |
| | duration of construction | *210–430 years* | *170–410 years* | *10–300 years* |
| | probability of context 394 date fitting model | | | 4.5% |
| *Model* | | *3* | *4* | *6* |
| Separate phases for inner & outer palisades | start of inner palisade construction | *2770–2470 cal. BC* | *2780–2460 cal. BC* | *2640–2310 cal. BC* |
| | end of inner palisade construction | *2260–1980 cal. BC* | *2300–1960 cal. BC* | *2340–2000 cal. BC* |
| | duration of inner palisade construction | *210–460 years* | *180–460 years* | *20–360 years* |
| | start of outer palisade construction | *2710–2290 cal. BC* | *2640–2280 cal. BC* | *2620–2280 cal. BC* |
| | end of outer palisade construction | *2320–1930 cal. BC* | *2410–2030 cal. BC* | *2410–2030 cal. BC* |
| | duration of outer palisade construction | *20–290 years* | *0–240 years* | *0–240 years* |
| | probability of context 394 date fitting model | | | 17.4% |
| | probability of start of inner palisade preceding start of outer palisade construction | 85.1% | 90.2% | 64.0% |
| | probability of end of inner palisade preceding end of outer palisade construction | 37.8% | 24.0% | 30.6% |

95% probability). Although the set of radiocarbon dates is coherent and shows little spread it is difficult to resolve conclusively questions about such short timespans when there are always residual doubts about the possibility of an old-wood effect. The radiocarbon dates are perhaps best interpreted in the light of a strong archaeological hypothesis of a short timespan for construction, and excluding all dates from flotation material and that from context [394]. In this case the construction can be said to have taken place over a period of 10–300 years (Model 5, 95% probability), starting in the period 2530–2310 cal BC and finishing sometime in the period 2340–2100 cal BC.

This likely start date of *c*. 2400 cal BC is becoming increasingly significant in the light of further recent investigations. The majority of available well-dated evidence for the period is from the Avebury and Stonehenge complexes and associated sites. Remedial work after the collapse of the top of the mound at Silbury Hill in 2000 provided the opportunity and impetus for works including a new programme of radiocarbon dating of the monument. Bayliss *et al.* have recently presented two chronological models for Silbury, both of which agree in placing the raising of the primary mound in the 24th or 23rd century cal BC (2007a, 42). Bayliss *et al.* note that this is broadly contemporary with the silting up of the ditches at Windmill Hill (Whittle *et al.* 1999); the secondary filling of the chambers and passage at West Kennet long barrow (Bayliss *et al.* 2007b); the small enclosure at Beckhampton (Gillings *et al.* 2002: 255; Pollard & Cleal 2004, 125); and the construction of the major ditch and bank at Avebury, perhaps in the second quarter of the 3rd millennium cal BC (Pollard & Cleal 2004). Dates for the West Kennet palisade enclosures are not precise but can nevertheless also be assigned to the second half of the 3rd millennium cal BC (Whittle

1997). Similarly at around 2400 cal BC, the English Beaker 'package' is first evident and Beakers begin to be placed in graves; the Beaker-associated Amesbury Archer was buried; and the first sarsen trilithons and sarsen circle at Stonehenge erected (Bayliss *et al.* 2007a; Current Archaeology 2008).

## DISCUSSION

When first identified during the site stripping, the enclosure was provisionally interpreted as a henge, however, it soon became apparent that the circuits were not formed from continuous ditches and that each was composed of a series of radially-aligned slots containing closely-spaced posts. Since surrounding banks and (in most cases) ditches are defining characteristics of henges, this enclosure does not belong to such a monument class. Instead it belongs to a much rarer category of monument, named as a 'stockaded enclosure' in the RCHME *Thesaurus of Monuments* and as a 'palisaded enclosure' by Whittle (1997) and Gibson (1998). The latter term has been favoured by later writers (eg, Brophy 2005, 1; Malone 2001, 181; Thomas 2003) and has been used in this paper, however, both terms imply a defensive function for the monument, which does not appear to be the case. There is no evidence for either ditches or banks, or for quarrying to provide material for such features. The circumference is too large to be easily defended, especially as there are gaps between the posts that are wide enough to squeeze through. In addition, the entrances are wide and, even if they were filled by smaller stakes, would present a weakness in the structure at its most vulnerable point. The site is in a lowland location overlooked by a hill and near a river. All this evidence suggests that the enclosure was not intended as a defensive structure.

Similar arguments have been applied to most other investigated Neolithic enclosures of this type. As an exception, the excavators of Meldon Bridge, Peebleshire, gave a defensive interpretation for their enclosure, (Burgess 1976; Speak & Burgess 1999, 106) although this has been questioned by later workers (Gibson 1998, 77).

It is also improbable that the structure was intended as a stock enclosure. Even if there had been horizontal timbers or hurdles between the uprights, it would be difficult to explain why there were two paired-post palisades, or indeed the purpose of the outer posts in each palisade if this was the function. These outer posts were free-standing uprights rather than angled to brace the inner posts so they would serve no useful purpose. In addition the entrances are too wide to be secured by a simple gate and would provide weak points in the enclosure. The lack of cultural material within or surrounding the enclosure suggests that there was no domestic, industrial, or agricultural settlement here. Although a limited number of post-holes were identified in the centre, there was no other evidence for occupation of the interior.

A ritual or ceremonial purpose is proposed for this site. Similar conclusions have been reached for the other known Neolithic palisaded enclosures in Britain (Gibson 2002, 15). In his survey of such monuments, Gibson listed just 19 potential palisaded enclosures for the whole of Great Britain (*ibid.)*. Six of those remain unproven and consist of unexcavated cropmarks or curving pit alignments that have not been traced for any great distance; one (at Ferrybridge, Yorkshire) has since been proven to be an Iron Age pit alignment and therefore an unrelated monument (Roberts 2005).

Gibson (1998) recognised three morphological types amongst such palisades: Type 1 Palisades consisting of spaced individual posts, each set in their own post pit (eg, Meldon Bridge); Type 2 consisting of close-set, but not contiguous, posts in closely-spaced pits (eg, Hindwell, Powys); and Type 3 consisting of contiguous posts set within a palisade trench (eg Mount Pleasant, Dorset). The Marne Barracks enclosure consists of close-set posts and, in this respect, fits most readily into the second of these morphological types. However, the other two examples of this type (Hindwell and Greyhound Yard, Dorchester) are the two largest such enclosures, with the most massive posts. Being smaller than average in area, and with average diameter posts, the Marne enclosure does not fit this typology well in these respects. Also the entrances to the Marne enclosure do not fit the pattern of narrow avenues typical of Type 1 palisades, nor the narrow gaps between massive posts at Type 2 palisades such as Hindwell (n.b. only part of the circuit has been identified at Greyhound Yard, a Type 2 enclosure; no entrances are present within this section). The Marne enclosure therefore does not readily fit into this typology and it may be that Gibson's three-fold division is too narrow and further work will identify a greater range of such monuments.

The known palisade monuments are shown on Figure 9; comparative data are provided in Table 4. Note, however, for Stonehenge that possible Neolithic palisaded enclosures may be represented amongst the mass of post-holes within the monument, whilst the palisade outside Stonehenge, of unknown prehistoric date, consists of a linear structure traceable for 1.3 km (Cleal *et al.* 1995, 155–61); it is not known whether this forms part of a very large enclosure or a linear boundary. Also, the enclosure at Blackshouse Burn in Lanarkshire consists of a double circuit of posts with a stone bank between them (Lelong & Pollard 1998) and is not strictly comparable with any of the other listed sites.

Even within this small group, there are significant differences between the enclosures. Few contain more than one palisade; the only known double-palisade examples being Ballynahatty (Co. Down), Blackshouse Burn, West Kennet 1, and Dunragit (Dumfries & Galloway). Although the latter contained an inner circuit that was originally interpreted as a third palisade, this was later re-interpreted as a ring of free-standing posts (Thomas 2003). The two definite palisades at this site were thought to have represented two separate phases. No other known enclosures contain the 'paired post' arrangement present in both of the palisades at Marne Barracks. This is a unique feature of this site.

In terms of size, these enclosures range from *c.* 1 ha for Ballynahatty up to *c.* 34 ha for Hindwell, though these two sites are exceptional in that all other known enclosures lie between 4 ha and 11 ha. The Marne Barracks enclosure, measuring 2.75 ha (within the outer palisade) is the second smallest but is significantly larger than Ballynahatty. Since the Marne enclosure effectively comprised four timber circuits, the total number of posts in the monument is similar to larger examples. Assuming that the geophysical anomalies to the south of the runway represent the southern edge of the monument, that the unexposed part continued in a similar fashion to the exposed part, that the part-exposed east entrance was similar in size to the north one, and that there were no further entrances, then there would have been a total of *c.* 580 post-slots containing *c.* 1160 posts in the outer palisade and *c.* 450 slots housing *c.* 900 posts in the inner palisade. This gives a total of just over 2000 posts in the whole monument, compared with 1600 posts for Mount Pleasant (Wainwright 1979, 237); 2800 posts for West Kennet 1 – a double palisade (Whittle 1997, 154); 1600 posts for West Kennet 2 (Whittle 1997, 154); and 1400 posts for Hindwell (Gibson 1999). There was no evidence for the use of split trunks (thereby reducing the number of trees that needed felling) at Marne, where all the posts appeared rounded in shape and typically measured 0.2–0.3 m in diameter, with an average of 0.26 m. This is comparable to the post diameters from the palisades at Ballynahatty, Blackshouse Burn, Meldon Bridge (western part), Stonehenge, and West Kennet 1 and 2 (Table 2). It is slightly smaller than the post diameters at Meldon Bridge (northern part), Mount Pleasant, and Walton, and considerably smaller than those at Hindwell and Greyhound Yard. Oak is the only type of wood so far recorded for the posts in palisaded enclosures.

A number of authors have attempted to calculate the ratio of above- to below-ground parts of posts. Using the lengths of post-ramps in timber circles as a guide, Mercer (1981, 149–50) estimated that it would be of the order of 3.5:1 and later authors (eg, Gibson 2002, 14; Speak & Burgess 1999, 107) have accepted this estimate. The maximum depth of any post-hole excavated within the Marne enclosure was 1.25 m; several other post-holes survived to over 1 m in depth. These depths do not take into account any topsoil that would have been present originally, or any subsequent ground truncation. The depths are therefore minimum values and it is likely that the posts would have stood over 4 m high above the ground surface. In a number of timber circle reconstructions, both drawn and in the field, lintels have been added, joining the tops of the uprights. This emphasises the circularity of the monument, which is assumed to be significant, and which would not necessarily be evident otherwise when viewing a complex of uprights from any distance. There is no evidence for such lintels at Marne Barracks.

No evidence was present to indicate that the gaps between the uprights had been filled to form a solid barrier, though such evidence has been identified elsewhere. For example, burnt clay in the upper fills of post-hole weathering cones at at Sarn-y-bryn-caled, Powys, may have come from wattle and daub panels; freshwater snails at Woodhenge, Wiltshire, may have been inadvertently brought onto site with mud and reeds for use on wattling, and carbonised planks were recovered from Machrie Moor, Arran, and North Mains, Perthshire, timber circles (Gibson 2005,

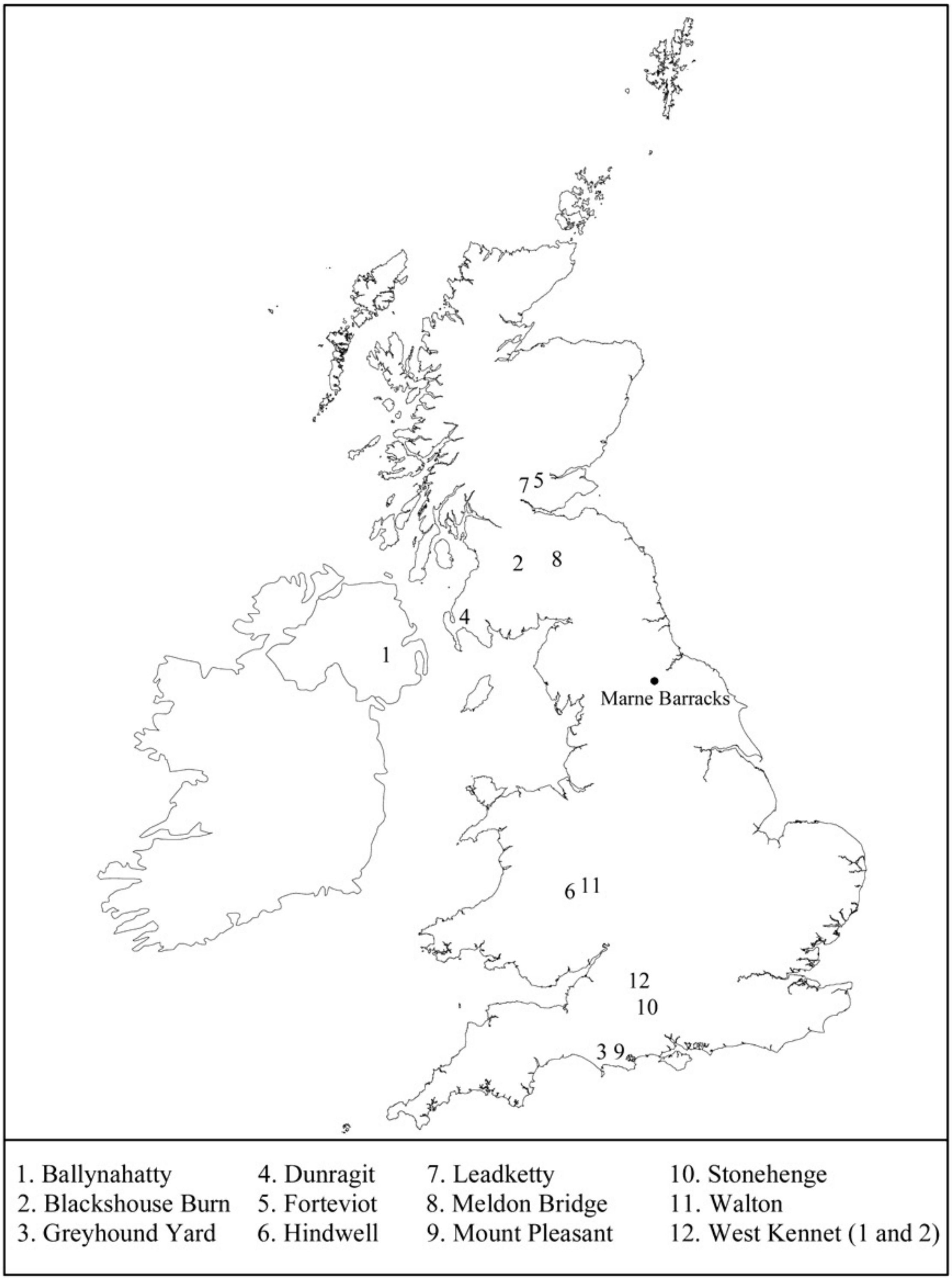


Fig. 9.
Distribution of British Late Neolithic palisaded enclosures

TABLE 4: COMPARISONS BETWEEN NEOLITHIC PALISADED ENCLOSURES IN BRITAIN

| | *No. palisades* | *Size (ha)* | *Post diam. (m)* | *No. posts* | *Entrance* |
|---|---|---|---|---|---|
| Ballynahatty | 2 | 1 | 0.3 | | Post Structure |
| Blackhouse Burn | 2 | 7 | 0.2–0.4 | | n/a |
| Dunragit | 2 | 7 | n/a | | Avenue |
| Forteviot | 1 | 6 | n/a | | Avenue |
| Greyhound Yard | 1 | *c*.11 | 0.9–1.2 | n/a | n/a |
| Hindwell | 1 | 34 | 0.8 | 1400 | Narrow gap |
| Leadketty | 1 | 7 | n/a | | Avenue |
| Meldon Bridge | 1 | 8 | 0.25–0.6 | 135 | Avenue |
| Mount Pleasant | 1 | 4.5 | 0.3–0.5 | 1600 | Narrow gap |
| Stonehenge | 1 | n/a | 0.25–0.4 | n/a | n/a |
| Walton | 1 | 8 | 0.6 | | Avenue |
| West Kennet I | 2 | 4 | 0.25–0.4 | 2800 | n/a |
| West Kennet II | 1 | 6 | 0.25–0.4 | 1600 | n/a |
| *Marne Barracks* | *2* | *2.75* | *0.2–0.3* | *2000* | *Stake structure* |

112–14). It is unlikely that horizontal timbers were slotted between the inner and outer posts in each palisade at Marne Barracks, as the spacing of the radial slots was so close that only very short sections of horizontal timber would have fitted within its curvature. It would have been much more efficient to build such a structure by using more widely spaced posts and longer horizontal members. If part of the intention of the palisade was to screen activities on its inside, then it may have been regarded as unnecessary to have a complete barrier. The four rings of posts would have created a 'vertical blind' effect, allowing a partial view to the interior from close-up but effectively restricting visual access from any distance; this may have been regarded as sufficient. The use of post-lined avenues at some sites to approach the enclosures obliquely has a similar effect in that visual access is limited until the entrance is reached.

Two entrances were identified in the Marne Barracks enclosure. The northern entrance measured 16.5 m in width through the outer palisade and 14 m in width through the inner palisade, while the eastern entrance was evident as a part-exposed gap of at least 5 m in the inner palisade. Excavated post-holes to either side of these gaps were of 'normal' depth, so the lack of slots in these areas cannot be explained by truncation of the monument. Stakes were present in the eastern entrance but no such features were found in the northern one, although this could have been due to preservation conditions at this point. These entrances are in marked contrast to those of other palisades. Dunragit, Forteviot and Leadketty (Perthshire), Meldon Bridge, and Walton (Powys) palisades all contain externally pointing double avenues of posts that approach the palisade at a slant, although the avenue for the central palisade at Dunragit approaches at a more perpendicular angle. No such external avenue was present within the excavation at Marne, though one, or more, could possibly exist to the south. Very narrow gaps, flanked by exceptionally large posts, form the entrances to the Hindwell and Mount Pleasant enclosures. Again no such entrances were present within the excavated part of the Marne enclosure. Its wide entrances are not paralleled by any other example and may strengthen the suggestion that these gaps were filled by stake-built structures.

Palisaded enclosures are typically found in ritual landscapes, reinforcing their interpretation as ritual monuments. The enclosure at Ballynahatty lies to the north of the Giant's Ring henge and chambered tomb and is surrounded by smaller ring-ditches and pits; Dunragit overlies a cursus and again is surrounded by ring-ditches and pit alignments; ring-ditches are associated with Forteviot and Leadketty; Hindwell and Walton lie in the Walton Basin where the complex of sites also includes ring-ditches and cursus monuments; Mount Pleasant is located within a hengiform enclosure and the ritual landscapes around Stonehenge and West Kennet are well-known. The location of the Marne Barracks enclosure is no exception, being part of the significant ritual focus on the Swale gravels. Closest to the site is a stone-filled ring-ditch of possible Bronze Age or earlier origin, 375 m to the south, which was identified during evaluation of the airfield (Archaeological Services 2002). Another ring-ditch identified by geophysical survey at Bainesse, on slightly higher ground immediately west of Marne Barracks (Archaeological Services 2005), is a possible barrow ditch. This has recently been partially excavated and contained 31 sherds of Peterborough Ware, a residue from which provided a radiocarbon age of 4470±35 BP (SUERC-20368 (GU17287)), 3340–3020 cal BC with 95% probability (G. Speed, pers. comm.).

A Late Neolithic/Early Bronze Age kerbed burial cairn, which was later incorporated into a circular ring-work thought to be a henge, was excavated 2 km north-west of Marne, at the southern end of Catterick Racecourse, in 1995 (Moloney *et al.* 2003; McLeod 2002). The cairn was surrounded by a kerb of large boulders and contained eight small, empty chambers, also made of large river boulders. The chambers are believed to be the graves of important people, whose bones had decayed in the dry, aerobic burial conditions. Several nearby pits were found to contain Neolithic decorated pottery vessels, a stone axe, and various flint tools, together with many burnt animal bones and evidence for other types of food including hazelnuts and apples, perhaps the remains of feasting (Moloney *et al.* 2003).

The number of Neolithic sites at Scorton, just 2 km north of Marne Barracks, has increased considerably in recent years, largely through investigations in advance of gravel extraction. The complex of monuments there centres around Hollow Banks Farm and includes a cursus (Topping 1982); various ring-ditches, pit alignments, and a hengiform enclosure (GeoQuest Associates 1997; Wessex Archaeology 1998a; 1998b; NAA 2000); a small square palisaded enclosure, dated to the later 4th millennium BC (G., Speed, pers. comm.); and a large timber oval, comprising six large, ramped post-pits, which is currently undated but could well prove to be Neolithic (G. Speed, pers. comm.). The cursus was a huge earthwork comprising two parallel ditches running across the landscape for some 2 km, forming a ceremonial avenue. Parts of two linear features which flank the cursus have recently been excavated and shown to be continuous palisade trenches (G. Speed, pers. comm.). An unexcavated circular feature, visible as a cropmark near Colburn Hall, 5 km away, has been identified as another possible henge (MacLeod 2002, 44). Less than 20 km to the south are the three well-known henges and cursus at Thornborough, and 5 km further south again are the three henges of Nunwick, Hutton Moor, and Cana Barn, all in the Swale-Ure interfluve. These groups of monuments, and indeed some individual monuments such as the Scorton cursus and the Marne Barracks palisaded enclosure, are generally aligned north-west to south-east. Whether this relates to ancient routeways, or has any astronomical significance, is yet to be determined, however, the orientation does reflect that of the rivers within the region.

In addition to being surrounded by ritual monuments, many of these palisaded enclosures also contained ritual sites. A double-post circle stands within the Ballynahatty enclosure; a penannular ring-ditch surrounded by a timber circle is present within Forteviot; ring-ditches are present within Leadketty and West Kennet 2; and Mount Pleasant encloses a multiple timber circle within a penannular ditch. Significantly none of these features is centrally placed within their enclosures; all are located towards one end with the remainder of the enclosure devoid of features. Given the margins of error inherent in dating features of this period, it is generally difficult to prove that the internal features are contemporary with the enclosures, however, the close association between these features on a number of sites suggests that this is the case. The 12 post-holes within the Marne Barracks enclosure were located along the south-west side of a low ridge that had been truncated by airfield levelling in the 1930s. It is therefore possible that more features had been present, but had been removed by later activity. In addition, 45% of the interior has not been investigated, again providing the potential for further internal features. The ridge occupied the centre of the enclosure, running approximately along its long axis, and would have enhanced the presence of any features upon it. Could the posts have been totemic, or part of two and four-post structures such as exposure platforms?

Many of the posts in the western side of the monument had been burnt *in situ*; elsewhere posts were intermittently preserved in this manner. The resulting concentrations of small charcoal fragments were regular in outline but rarely extended to the full depth of the post-holes. Apart from the fact that they contained charcoal, the gravel in these patches was identical to the remainder of the post-hole fills. It is unlikely that these deposits were formed by the deliberate removal of the posts and subsequent infill of the post-pipes by surface material. The regular shape of the charcoal patches (rather than distorted by the rocking and twisting that would be necessary to extract the post), the similarity of their fills to those of the surrounding post-holes and the high concentration of charcoal all argue against this. Nor is this due to charring of the post before setting, in order to prolong its life. Such a procedure would result in a ring of charcoal, which would extend to the full depth of the post-hole. Instead it is thought that the above-ground parts of the posts were burnt *in situ*. If the posts were rotten, this would allow the below-ground parts to smoulder for some time, carbonising the timber (Atkinson 1985, 47). At Marne the carbonisation was only intense enough to affect the upper part of the buried post, accounting for the fact that charcoal only extended part-way to the base of the cuts. Local variations in ground conditions and the intensity of burning are likely to account for the spatial variation in the survival of carbonised post remains.

Several other palisaded enclosures also show signs of having burnt down. Such evidence has been found at Ballynahatty (Hartwell 1998, 43), Greyhound Yard (Woodward *et al*. 1984, 30), and both West Kennet enclosures (Whittle 1997, 158). While plausible causes of chance conflagrations can be suggested (eg, lightning strikes or forest fires that engulf the enclosure), such events would be rare. In addition, these structures are not designed for defence and in general there is little evidence for significant conflict in this period (Whittle 1997, 157) so it is unlikely that they were burnt as a result of hostile action. It lies beyond the realm of co-incidence to suppose that all these palisades had independently burnt down by accident. Therefore it has been suggested that these monuments were deliberately burnt down as a decommissioning ritual for the structure, perhaps symbolising death and rebirth (Whittle 1997, 158).

A number of large Late Neolithic mounds are known, and many of these are associated with henges or palisaded enclosures. The best known of these is Silbury Hill, which overlooks the West Kennet enclosures. Other examples include Conquer Barrow in Dorset, overlooking Mount Pleasant henge and palisade, Marlborough Mound (Wiltshire), Hatfield Barrow (contained within Marden Henge, Wiltshire) and Duggleby Howe (Yorkshire). William Stukeley, writing in the 1740s, suggested that Silbury Hill could have been a 'viewing platform'. More recently, Barrett (1994, 31) has suggested that it formed a raised platform from which a select group could observe activities in the surrounding enclosures, and that other such Neolithic mounds had a similar function, an interpretation for which there is considerable circumstantial evidence. The Dunragit palisaded enclosure is also overlooked by a large mound (Droughduil Mote), one that had long been interpreted as a medieval motte. However, the form of the mound and its location in exposed low-lying land appeared slightly unusual compared to other local mottes and so it was investigated as part of an excavation programme on the palisades. This excavation proved it to be an artificial mound of uncertain date but capped by an Early Bronze Age cairn (Thomas 2003). It could therefore be a similar Neolithic 'viewing platform'. In a similar vein, it has also been suggested that Knapp Mount (which lies outside the Walton palisade), another unexcavated feature long identified as a motte, is also a mis-identified Neolithic mound (CPAT 2004).

Interestingly the Marne Barracks palisaded enclosure is overlooked by a similar mound (Castle Hills), again identified as a motte on morphological grounds but recognised to be slightly abnormal in shape. The only excavation known to have taken place on Castle Hills was carried out under the orders of Lord Tyrconnel of Kiplin Hall in *c*. 1845 (MacLauchlan 1849, 348), reputedly in the southern entrance to the bailey. A number of finds, including both Romano-British and later material, were recovered and are now in the British Museum (Wilson 2002, 32). Wilson explains the presence of Romano-British material as being residual, scraped up with surrounding soils to enhance the motte mound. However, the quantity found (six sherds of pottery together with a brooch, a jet bead, and an iron bolt head) could indicate pre-Norman occupation of the 'hills' as well. This suggestion of an earlier history of occupation has been made by a number of authors (eg MacLauchlan 1849; Cramp *in* Wilson *et al*. 1996). The discovery of the Late Neolithic palisaded enclosure raises the possibility that the mound may have an even longer history, perhaps associated with the enclosure.

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BIBLIOGRAPHY

Archaeological Services. 2001a. *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 1: assessment report*. Durham: Archaeological Services unpublished report 703

Archaeological Services. 2001b. *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 2: geophysical evaluation*. Durham: Archaeological Services unpublished report 801

Archaeological Services. 2002. *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 3: evaluation*. Durham: Archaeological Services unpublished report 911

Archaeological Services. 2005. *A1(T) Dishforth to Barton Improvement, North Yorkshire: geophysical surveys*. Durham: Archaeological Services unpublished report 1121

Archaeological Services. 2006. *Marne Barracks, Catterick, North Yorkshire: post-excavation analysis report*. Durham: Archaeological Services unpublished report 1387

Atkinson, R.J.C. 1985. Worms, charcoal and postholes. *Antiquity* 59, 47–8

Barrett, J.C. 1994. *Fragments from Antiquity: an archaeology of social life in Britain, 2900–1200* BC. Oxford: Blackwell

Bayliss, A., McAvoy, F. & Whittle, A. 2007a. The world recreated: redating Silbury Hill in its monumental landscape. *Antiquity* 81, 26–53

Bayliss, A., Whittle, A. & Wysocki, M. 2007b. Talking about my generation: the date of the West Kennet long barrow. *Cambridge Archaeological Journal* 17(1), Supplement, 85–101

Bronk Ramsey, C. 1995. Radiocarbon calibration and analysis of stratigraphy: the OxCal Program. *Radiocarbon* 37 (2), 425–30

Bronk Ramsey, C. 2001. Development of the radiocarbon program OxCal. *Radiocarbon* 43(2A), 381–9

Brophy, K. 2005. Not in my type: discourses in monumentality. In V. Cummings & A. Pannett (eds), *Set in Stone: new approaches to Neolithic monuments in Scotland*. Oxford: Oxbow

Buck, C.E., Litton, C. & Cavanagh, W. 1996. *Bayesian Approach to Interpreting Archaeological Data*. Chichester: Wiley

Burgess, C. 1976. Meldon Bridge, a Neolithic defended promontory complex near Peebles. In C. Burgess & R. Miket (eds), *Settlement and Economy in the Third and Second Millennia* BC, 151–79. Oxford: British Archaeological Report 33

Cardwell, P. & Speed, G. 1996. Excavation of the Hospital of St Giles by Brompton Bridge, North Yorkshire. *Durham Archaeological Journal* 12, 27–40

Cleal, R.M.J., Walker, K.E., & Montague, R. 1995. *Stonehenge in its Landscape: the twentieth-century excavations*. London: English Heritage

Cosgrave, B. & Mynors, R.A.B. (eds). 1969. *Bede's Ecclesiastical History of the English People*. Oxford: Clarendon

CPAT. 2004. Information from internet website

*Current Archaeology* 2008. Silbury Hill: A last look inside. *Current Archaeology* 215, 12–20

GeoQuest Associates 1994. *Archaeological Excavations at RAF Catterick, North Yorkshire, 1994*. Consett: unpublished report

GeoQuest Associates 1997. *An Archaeological Assessment of the Proposed Scorton Quarry Extension, Brompton-on-Swale, North Yorkshire*. Consett: unpublished report

Gibson, A.M. 1998. Hindwell and Neolithic palisades of Britain and Ireland. In A. Gibson & D. Simpson (eds), *Prehistoric Ritual and Religion: essays in honour of Aubrey Burl* 68–79. Stroud: Sutton

Gibson, A.M. 1999. *The Walton Basin Project: excavation and survey in a Prehistoric landscape, 1993–7*. York: Council for British Archaeology Research Report 118

Gibson, A.M. (ed.). 2002. *Behind Wooden Walls: Neolithic palisaded enclosures in Europe*. Oxford: British Archaeological Report S1013

Gibson, A.M. 2005. *Stonehenge and Timber Circles*. Stroud: Tempus

Gillings, M., Pollard, J. & Wheatley, D. 2002. Excavations at the Beckhampton enclosure, Avenue and Cove, Avebury: an interim report on the 2000 season. *Wiltshire Archaeological & Natural History Magazine* 95, 249–58

Hartwell, B. 1998. The Ballynahatty complex. In A. Gibson & D. Simpson (eds), *Prehistoric Ritual and Religion: essays in Honour of Aubrey Burl*, 32–44. Stroud: Sutton

Hildyard, E.J.W. 1955. A Roman and Saxon site at Catterick. *Yorkshire Archaeological Journal* 38, 241–5

Lelong, O. & Pollard, T. 1998. The excavation and survey of prehistoric enclosures at Blackshouse Burn, Lanarkshire. *Proceedings of the Society of Antiquities of Scotland* 128, 13–53

MacLauchlan, H. 1849. On the Roman roads, camps and other earthworks between the Tees and the Swale in the North Riding of the County of York. *Archaeological Journal* 6, 335–51

MacLeod, D. 2002. Cropmarks in the A1 corridor between Catterick and Brompton-on-Swale. In Wilson 2002

Makey, P. 1994. Lithics. In P.R. Wilson, *A1 Motorway Leeming to Scotch Corner central sector, Stage 3 archaeological assessment field survey report*. Unpublished report for WS Atkins-Northern & Highways Agency

Malone, C. 2001. *Neolithic Britain and Ireland*. Stroud: Tempus

Mercer, R.J. 1981. The excavation of a late Neolithic henge-type enclosure at Balfarg, Markinch, Scotland. *Proceedings of the Society of Antiquities of Scotland* 111, 63–171

Moloney, C., Holbrey, R., Wheelhouse, P. & Roberts, I. 2003. *Catterick Racecourse, North Yorkshire: the reuse and adaptation of a monument from prehistoric to Anglian times*. Leeds: Archaeological Services (WYAS) Publication 4

N.A.A. 2000. Recent work by Northern Archaeological Associates. *CBA Forum 2000*

Pollard, J. & Cleal, J. 2004. Dating Avebury. In R. Cleal & J. Pollard (eds), *Monuments and Material Culture. Papers in Honour of an Avebury Archaeologist: Isobel Smith*, 120–9. East Knoyle: Hobnob Press

Reimer, P.J., Baillie, M.G.L., Bard, E., Bayliss, A., Warren Beck, J., Chanda, J., Bertrand, H., Blackwell, P.G., Buck, C.E., Burr, G.S., Cutler, K.B., Damon, P.E., Edwards, R.L., Fairbanks, R.G., Friedrich, M., Guilderson, T.P., Hogg, A.G., Hughen, K.A., Kromer, B., McCormac, G., Manning, S., Bronk Ramsey, C., Reimer, R.W., Remmele, S., Southon, J.R., Stuiver, M., Talamo, S., Taylor, F.W., Plicht, J. van der & Weyhenmeyer, C.E. 2004. IntCal04 terrestrial radiocarbon age calibration, 0–26 Cal Kyr BP. *Radiocarbon* 46 1029–58

Roberts, I. 2005. *Ferrybridge Henge: the ritual landscape*. Leeds: Yorkshire Archaeology 10

Speak, S. & Burgess, C.B. 1999. Meldon Bridge: a centre of the third millennium BC in Peebleshire. *Proceedings of the Society of Antiquities of Scotland* 129, 1–118

Thomas, J. 2003. Information from internet website

Topping, P. 1982. Excavation at the cursus at Scorton, North Yorkshire, 1978. *Yorkshire Archaeological Journal* 54, 7–21

Wainwright, G.J. 1979. *Mount Pleasant, Dorset: excavations 1970–71*. London: Report of the Research Committee of the Society of Antiquaries of London 37

Wessex Archaeology 1998a. *Hollowbanks Farm, Scorton: archaeological evaluation report 1: Field 2*. Salisbury: unpublished report

Wessex Archaeology 1998b. *Hollowbanks Farm, Scorton: archaeological evaluation report 2: Fields 3 & 4*. Salisbury: unpublished report

Whittle, A.W.R. 1997. *Sacred Mound, Holy Rings: Silbury Hill and the West Kennet palisade enclosures: a later Neolithic complex in north Wiltshire*. Oxford: Oxbow

Whittle, A., Pollard, J. & Grigson, C. 1999. *The Harmony of Symbols: the Windmill Hill causewayed enclosure, Wiltshire*. Oxford: Oxbow

Wilson, P.R. 1984. Recent work at Catterick. In P.R. Wilson, R.F.J. Jones & D.M. Evans (eds), *Settlement and Society in the Roman North*, 75–82. Bradford: University of Bradford & Yorkshire Archaeological Society

Wilson, P.R. 2002. *Cataractonium. Roman Catterick and its Hinterland. Excavations and Research, 1958–1997*. York: Council for British Archaeology Research Report 129

Wilson, P.R., Cardwell, P., Cramp, R.J., Evans, J., Taylor-Wilson, R.H., Thompson, A. & Wacher, J.S. 1996. Early Anglian Catterick and *Catraeth*. *Medieval Archaeology* 40, 1–61

Whitelock, D. 1955. *English Historical Documents, c.500–1042*. London: Eyre and Spottiswood.

Woodward, P.J., Davies, S.M. & Graham, A.H. 1984. Excavations at Greyhound Yard car park, Dorchester, 1984. *Proceedings of the Dorset Natural History and Archaeological Society,* 106, 99–106

## APPENDIX 1: SITE PLANS AND SELECTED SECTIONS

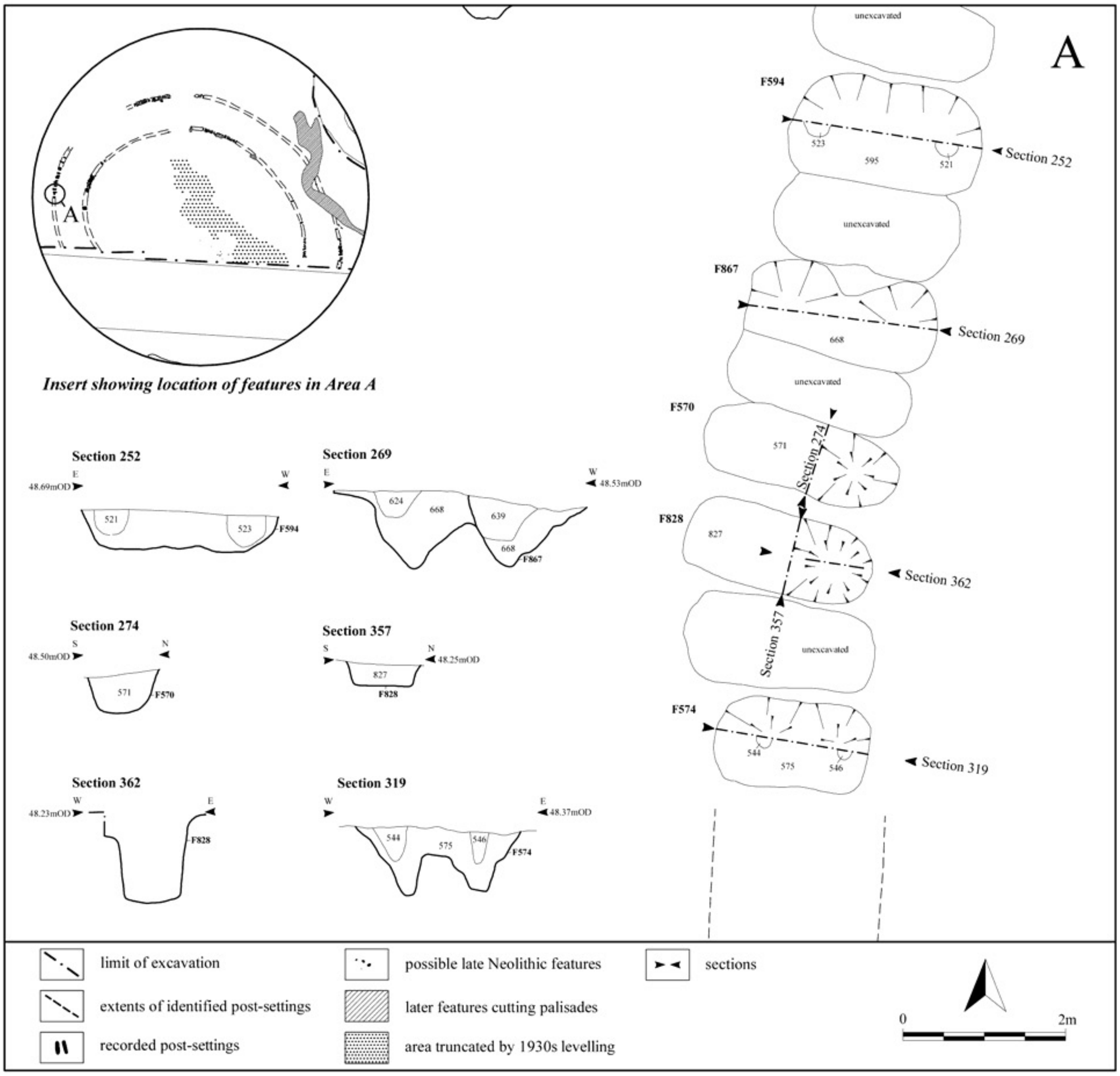


Fig. 10.
The outer palisade features: plans and sections, Area A

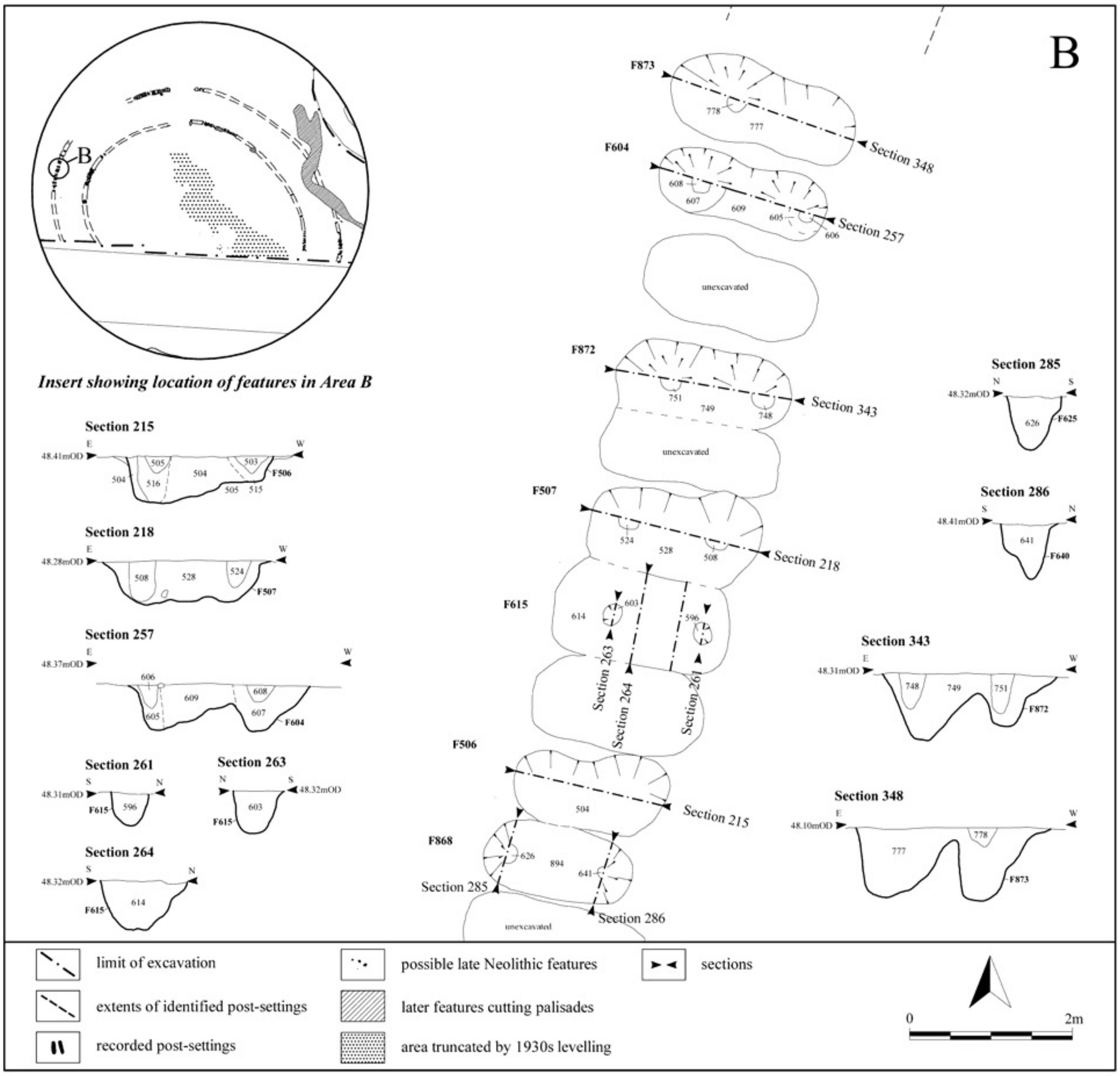


Fig. 11.
The outer palisade features: plans and sections, Area B

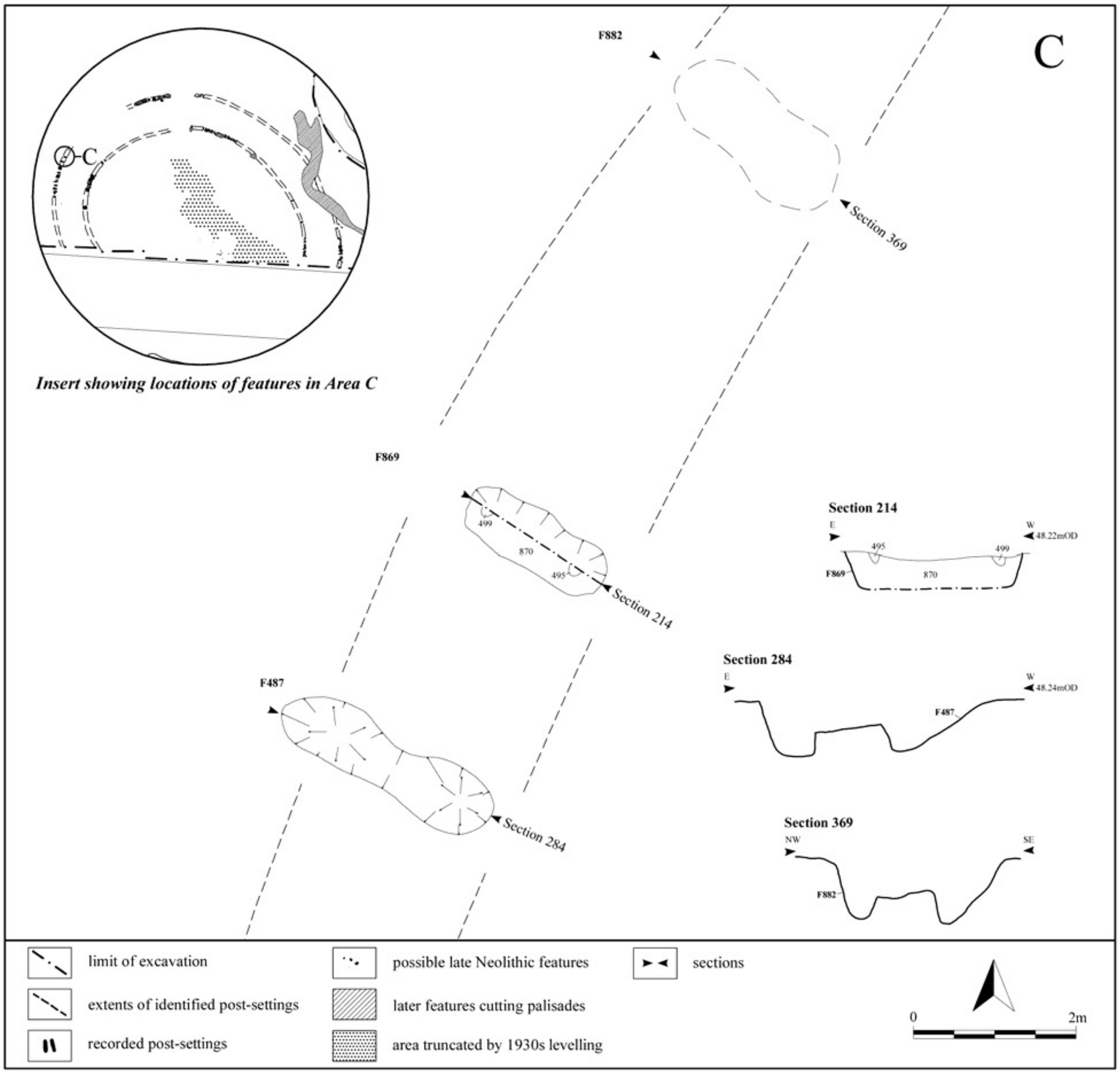


Fig. 12.
The outer palisade features: plans and sections, Area C

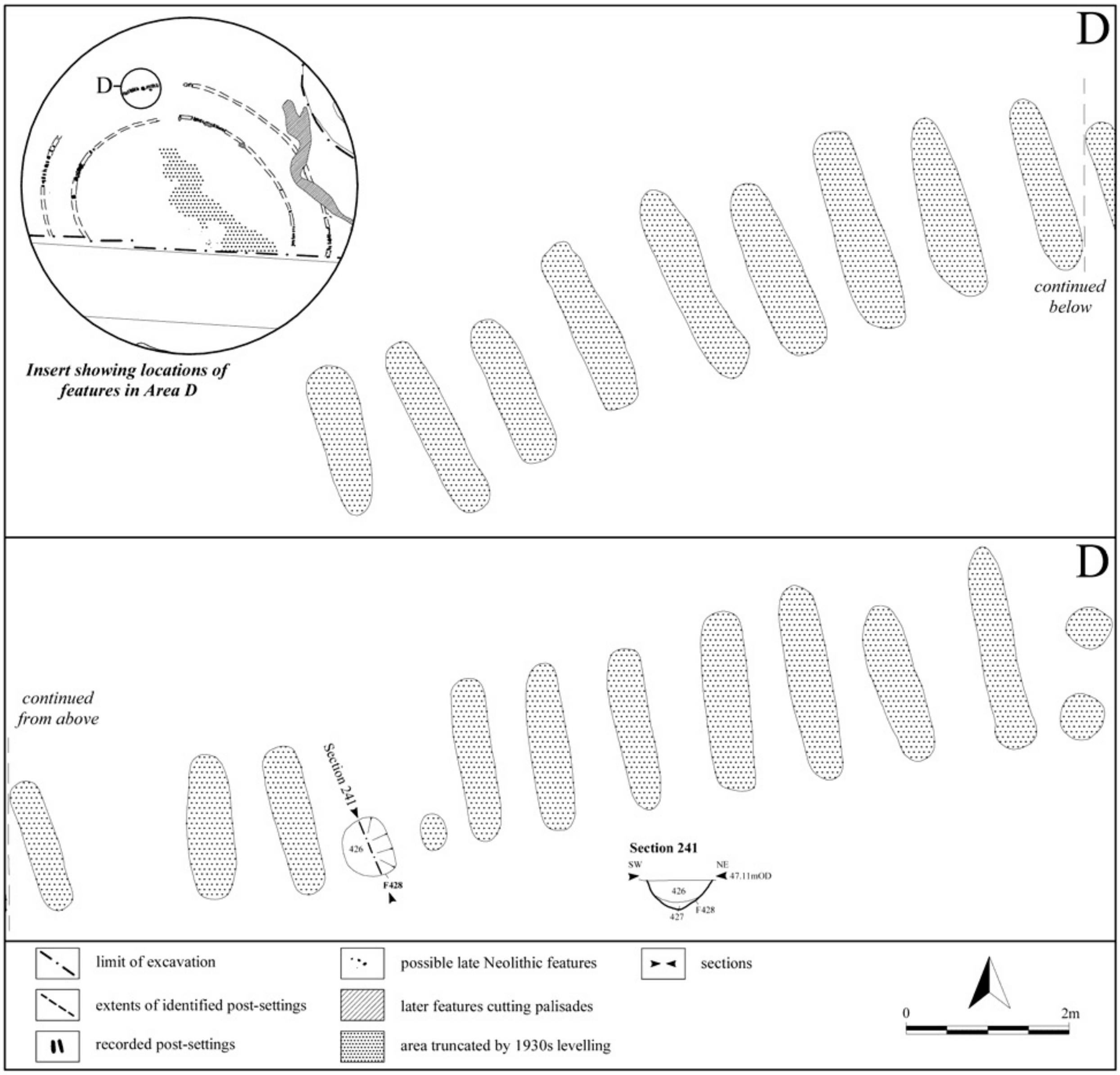


Fig. 13.
The outer palisade features: plans and sections, Area D

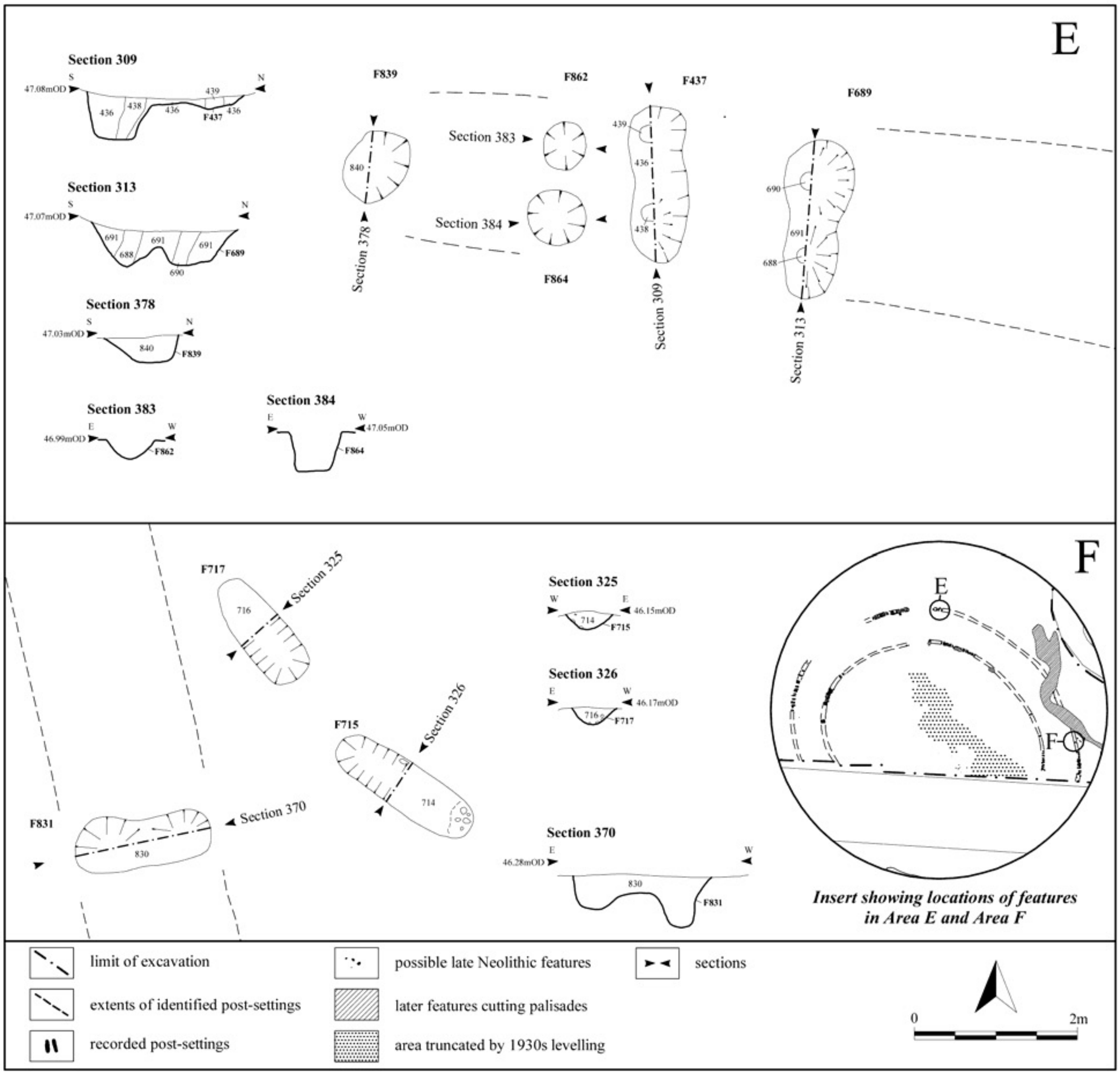


Fig. 14.
The outer palisade features: plans and sections, Areas E & F

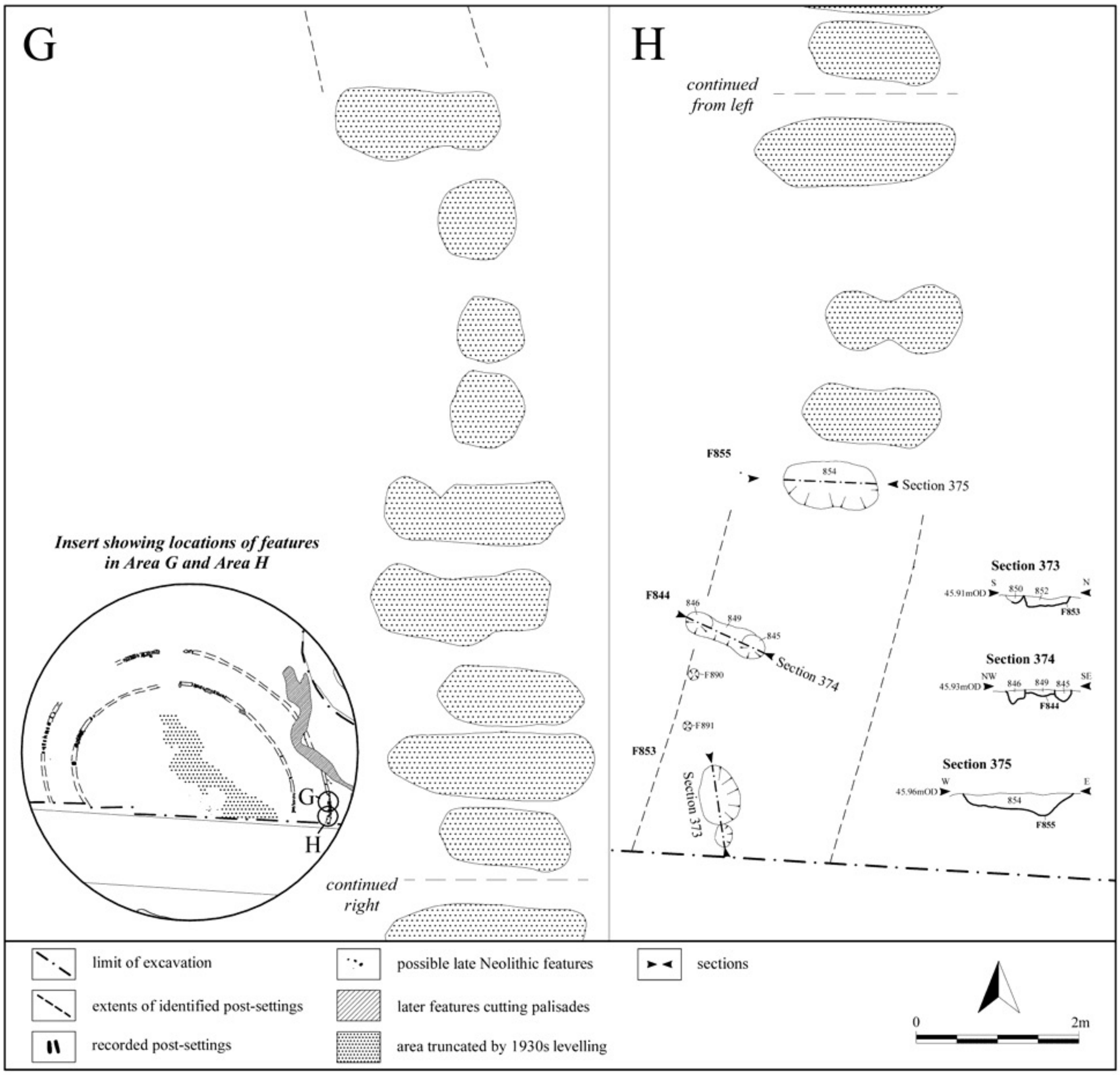


Fig. 15.
The outer palisade features: plans and sections, Areas G & H

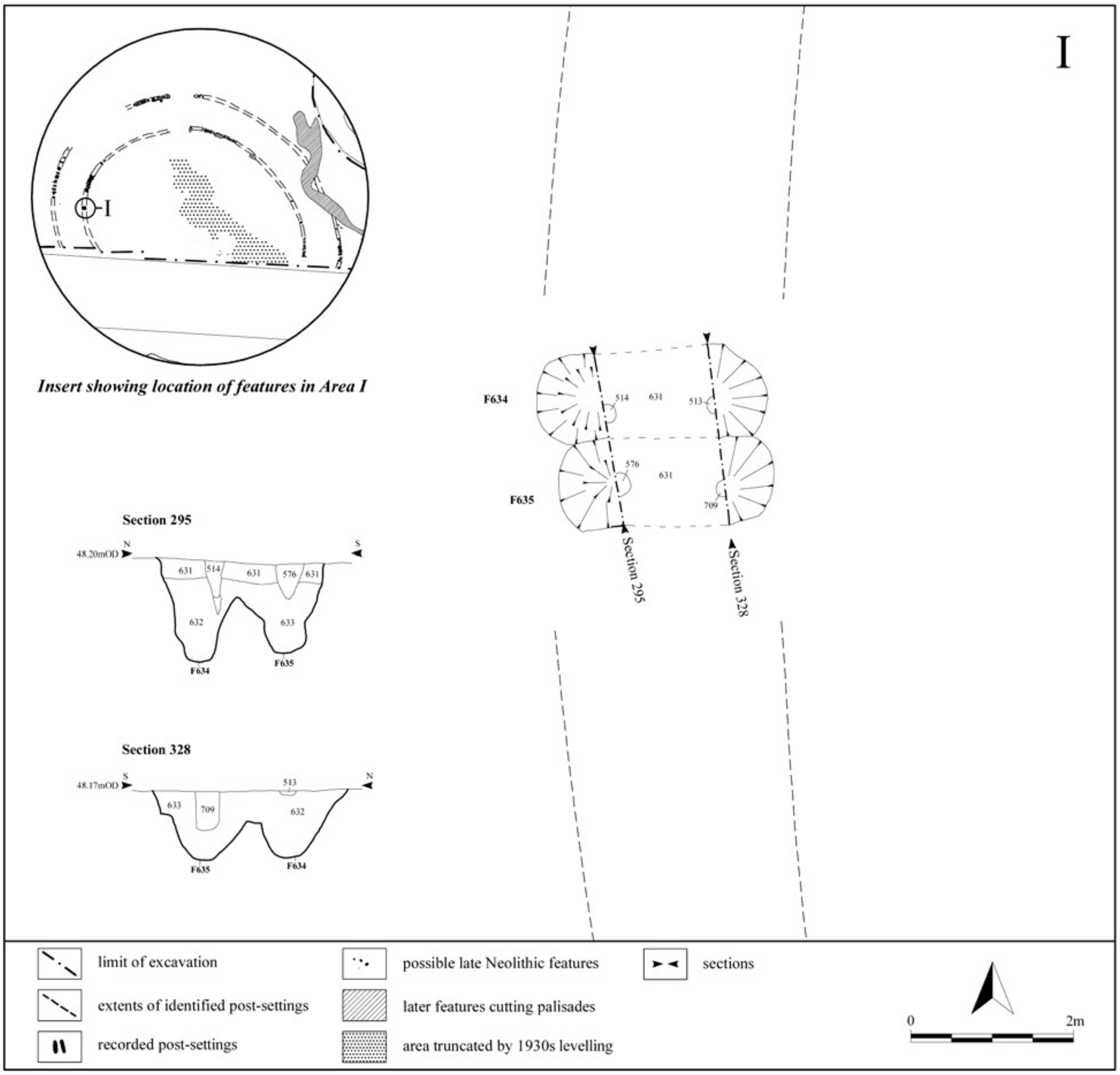


Fig. 16.
The inner palisade features: plans and sections, Area I


Fig. 17.
The inner palisade features: plans, Area J

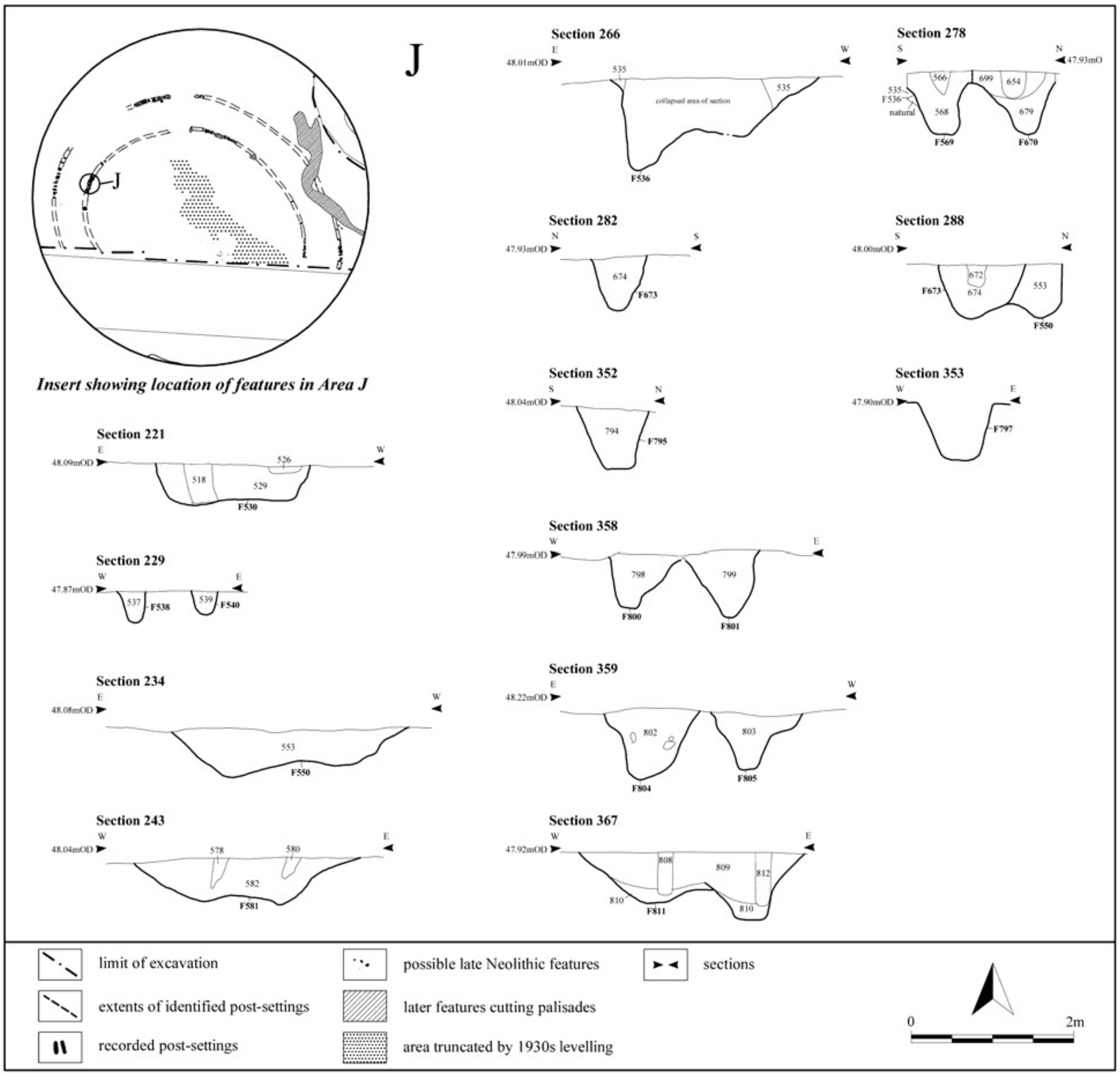


Fig. 18.
The inner palisade features: sections, Area J

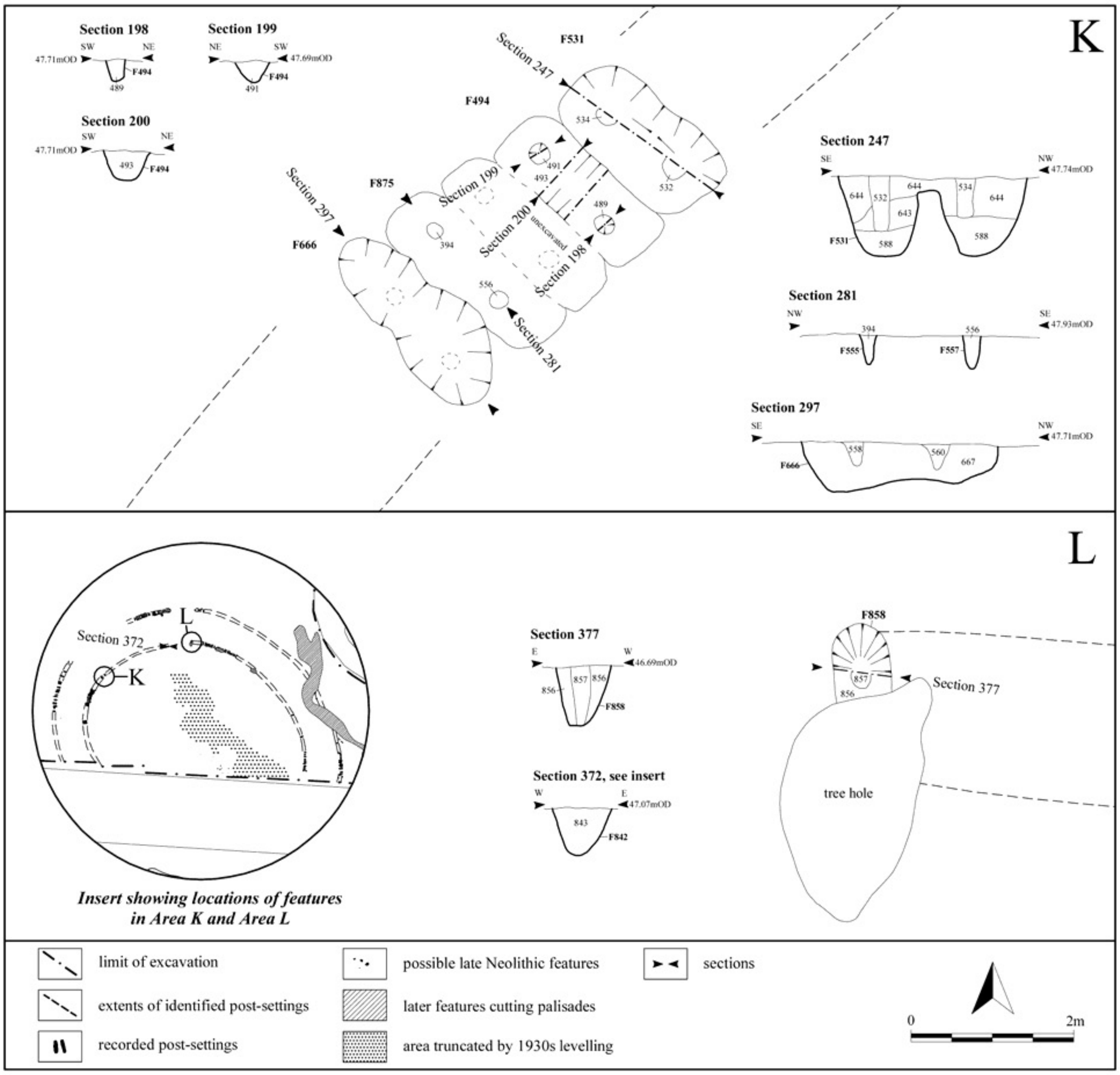


Fig. 19.
The inner palisade features: plans and sections, Areas K & L

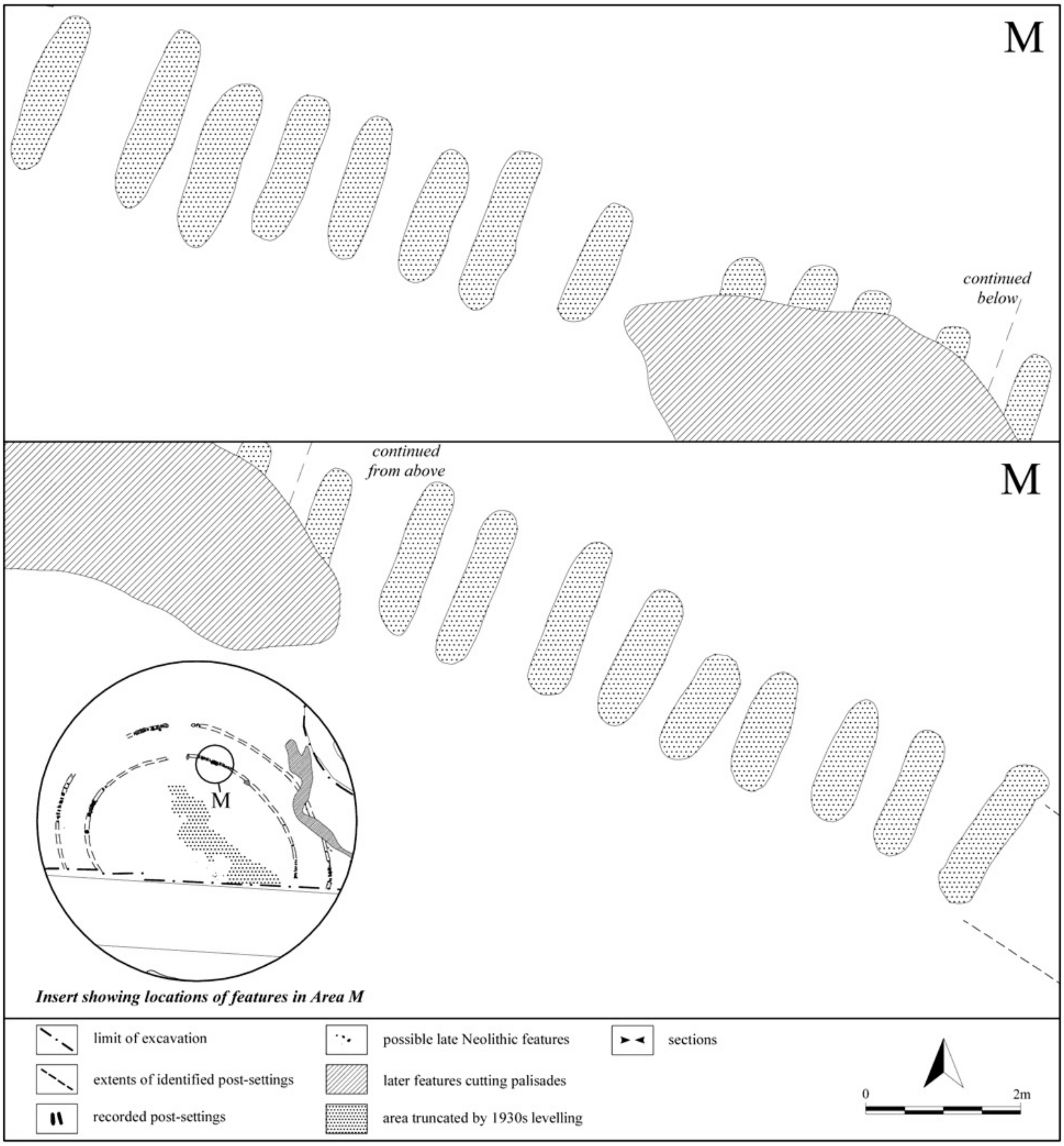


Fig. 20.
The inner palisade features: plans, Area M

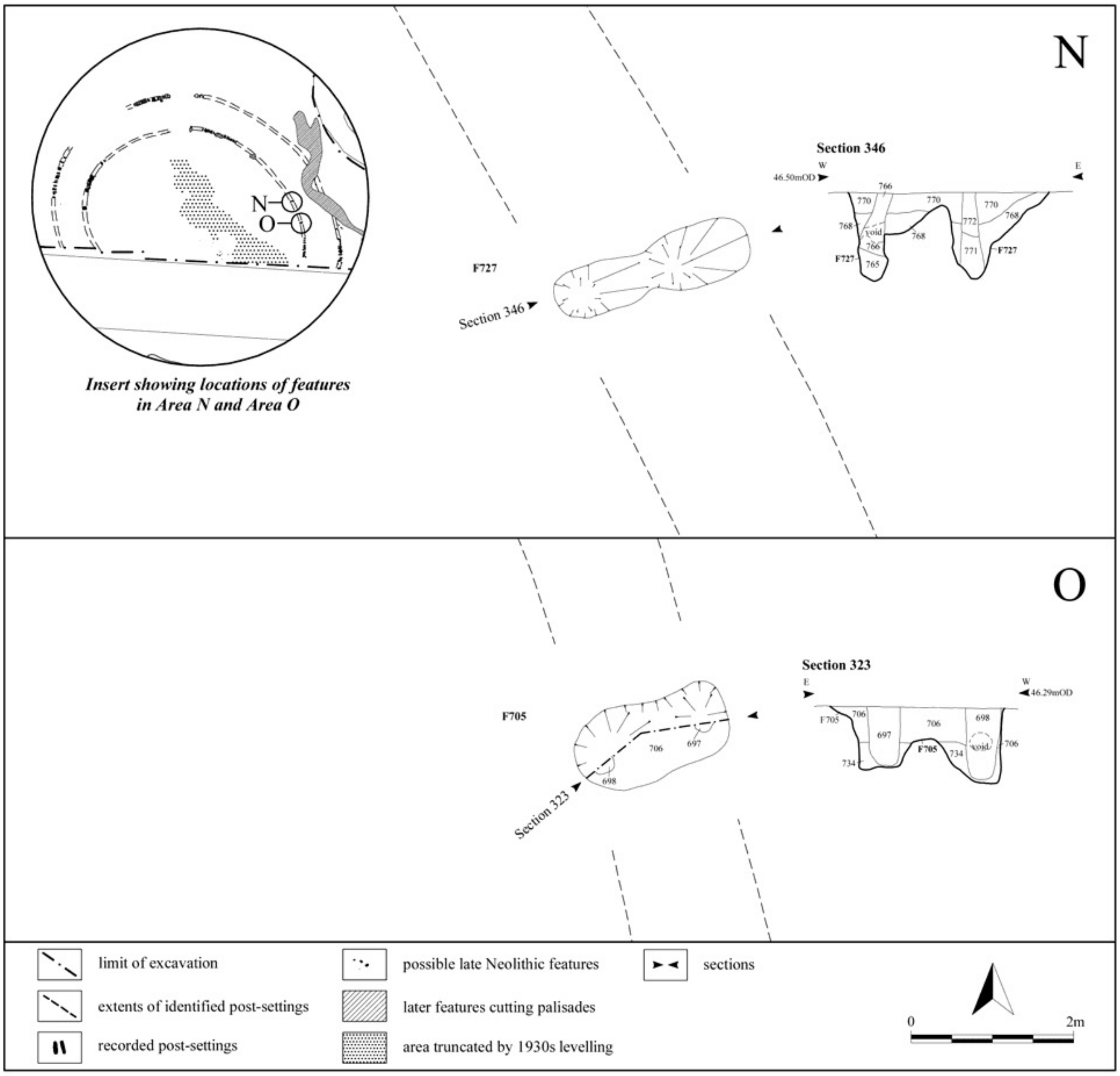


Fig. 21.
The inner palisade features: plans and sections, Areas N & O

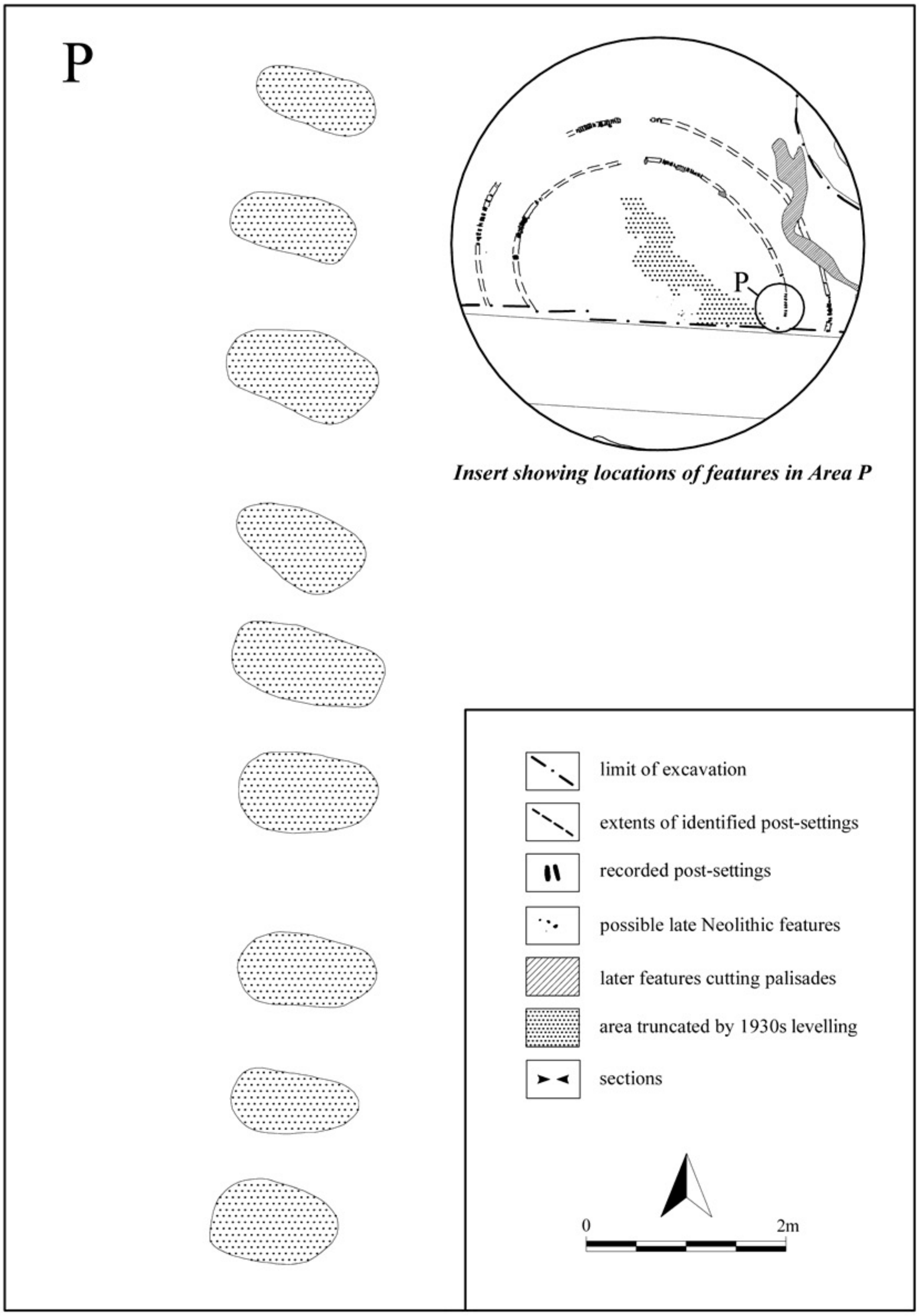


Fig. 22.
The inner palisade features: plans, Area P

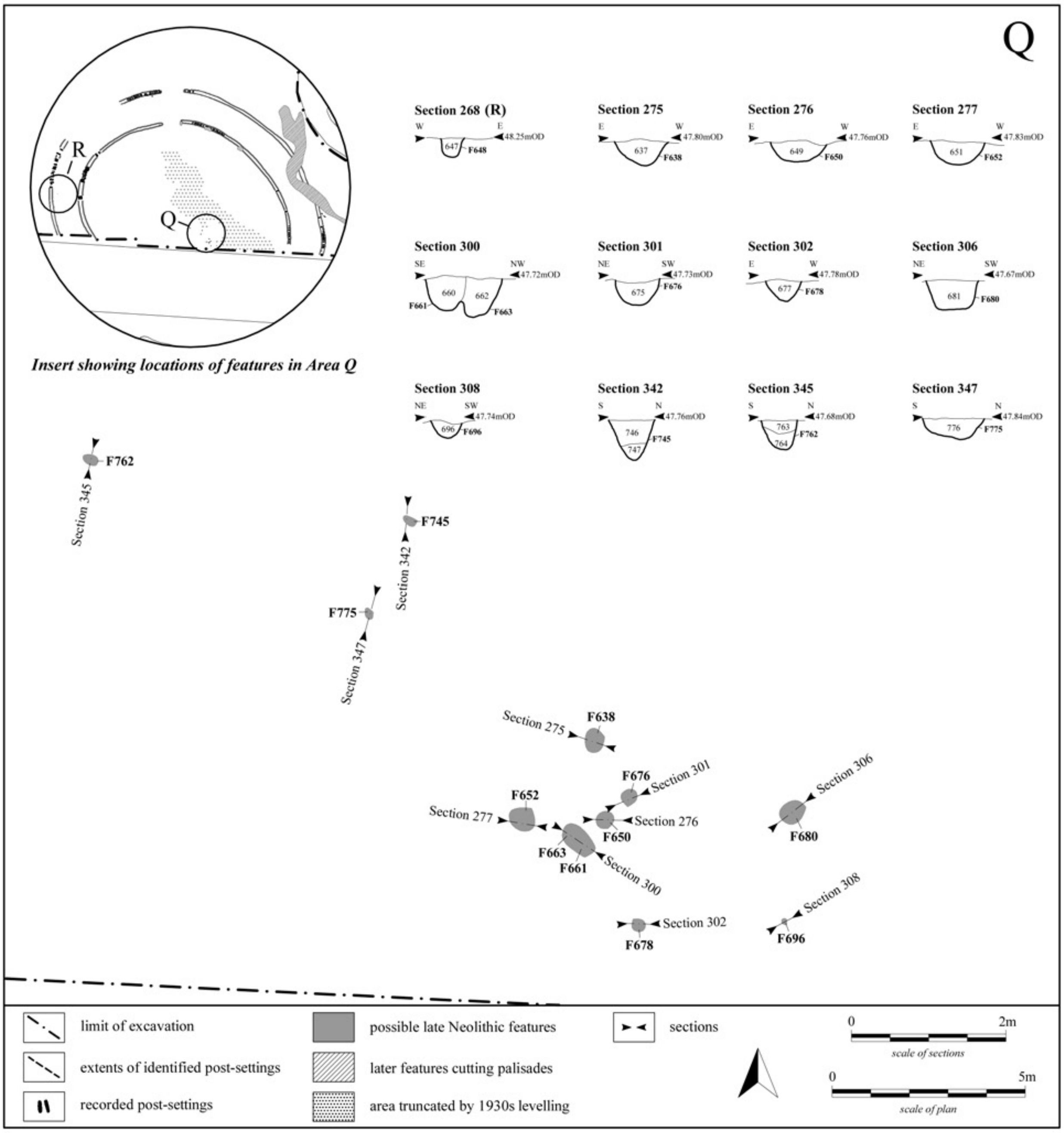


Fig. 23.
Internal features: plans and sections

APPENDIX 2: DIMENSIONS OF RADIAL SLOTS IN OUTER AND INNER PALISADES (M)

A: OUTER PALISADE

| Slot no. | *[F574]* | *[F828]* | *[F570]* | *[F867]* | *[F594]* | *[F868]* | *[F506]* | *[F615]* | *[F507]* | *[F872]* | *[F604]* | *[F873]* | *[F487]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slot fill | [575] | [827] | [571] | [668] | [595] | [894] | [504] | [614] | [528] | [749] | [609] | [777] | [484] |
| Max. length | 1.9 | 1.85 | 2.4 | 2.4 | 2.3 | 1.8 | 1.9 | 1.8 | 2.1 | 2.1 | 2.1 | 2.4 | 3.1 |
| Max. width | 0.6 | 1.0 | 0.9 | 1.0 | 1.1 | 0.9 | 1.1 | 1.1 | 1.0 | 0.9 | 1.1 | 1.0 | 0.8 |
| Outer post setting | - | - | - | [639] | - | - | - | - | - | - | - | - | - |
| depth | 0.8 | - | - | 0.8 | >0.45 | 0.7 | 0.6 | 0.6 | 0.5 | 0.65 | 0.6 | 0.9 | 0.75 |
| diameter | 0.4 | - | - | 0.5 | 1.1 | 0.75 | 0.5 | 0.5 | 0.6 | 0.5 | 0.6 | 0.6 | 0.7 |
| Inner post setting | - | - | - | [624] | - | - | - | - | - | - | - | - | - |
| depth | 0.8 | 1.1 | 0.8 | 0.9 | >0.45 | 0.7 | 0.6 | 0.3 | 0.45 | 0.8 | 0.6 | 0.8 | 0.75 |
| diameter | 0.4 | 1.0 | 0.9 | 0.6 | 1.1 | 0.8 | 0.55 | 0.6 | 0.6 | 0.75 | 0.75 | 0.8 | 0.75 |
| Outer post | [546] | - | - | [639] | [523] | [626] | [503] | [603] | [524] | [751] | [608] | [778] | [486] |
| depth | 0.4 | - | - | 0.45 | 0.35 | 0.7 | 0.2 | 0.5 | 0.3 | 0.4 | 0.2 | 0.25 | 0.6 |
| diameter | 0.2 | - | - | 0.4 | 0.5 | 0.2 | 0.25 | 0.25 | 0.25 | 0.25 | 0.3 | 0.3 | 0.4 |
| Inner post | [544] | - | [573] | [624] | [521] | [641] | [505] | [596] | [508] | [748] | [606] | - | [485] |
| depth | 0.4 | - | 0.5 | 0.3 | 0.4 | 0.8 | 0.2 | 0.35 | 0.5 | 0.45 | 0.25 | - | 0.75 |
| diameter | 0.25 | - | ? | 0.35 | 0.4 | 0.2 | 0.25 | 0.3 | 0.3 | 0.3 | 0.2 | - | 0.45 |
| Sections | 319 | 357 | 274 | 269 | 252 | 285 | 215 | 261 | 218 | 343 | 257 | 348 | 284 |
| | | 362 | | | | 286 | | 263 | | | | | |
| | | | | | | | | 264 | | | | | |

| *Slot no.* | *[F869]* | *[F882]* | *[F862/4]* | *[F437]* | *[F689]* | *[F831]* | *[F855]* | *[F844]* |
|---|---|---|---|---|---|---|---|---|
| Slot fill | [870] | [883] | [861/3] | [436] | [691] | [830] | [854] | [849] |
| Max. length | 2.1 | 2.4 | - | 1.9 | 1.9 | 1.8 | 1.2 | 0.9 |
| Max. width | 0.8 | 0.7 | - | 0.7 | 0.8 | 0.6 | 0.5 | 0.3 |
| Outer post setting | - | - | [F862] | - | - | - | - | - |
| depth | >0.75 | >0.9 | 0.25 | 0.15 | 0.4 | 0.4 | 0.25 | - |
| diameter | - | - | 0.6 | 0.5 | 0.6 | 0.5 | 0.4 | - |
| Inner post setting | - | - | [F864] | - | - | - | - | - |
| depth | >0.75 | >0.9 | 0.5 | 0.55 | 0.35 | 0.6 | 0.2 | - |
| diameter | - | - | 0.7 | 0.6 | 0.6 | 0.5 | 0.4 | - |
| Outer post | [499] | - | - | [439] | [690] | - | - | [845] |
| depth | 0.1 | - | - | 0.15 | 0.4 | - | - | 0.15 |
| diameter | 0.2 | - | - | 0.2 | 0.25 | - | - | 0.25 |
| Inner post | [495] | - | - | [438] | [688] | - | - | [846] |
| depth | 0.1 | - | - | 0.5 | 0.45 | - | - | 0.1 |
| diameter0.15 | - | - | | 0.25 | 0.2 | - | - | 0.2 |
| Sections | 214 | - | 383 | 309 | 313 | 370 | 375 | 374 |
| | | | 384 | | | | | |

APPENDIX 2: DIMENSIONS OF RADIAL SLOTS IN OUTER AND INNER PALISADES (M)

B: INNER PALISADE

| *Slot no.* | *[F635]* | *[F634]* | *[F530]* | *[F881]* | *[F880]* | *[F879]* | *[F673]* | *[F550]* | *[F581]* | *[F811]* | *[F536]* | *[F569]* | *[F670]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Slot fill* | *[631/3]* | *[631/2]* | *[529]* | *[802/3]* | *[798/9]* | *[794/6]* | *[674]* | *[553]* | *[582]* | *[809/10]* | *[535]* | *[568]* | *[669/79]* |
| Max. length | 2.6 | 2.9 | 2.1 | - | - | - | 2.3 | 2.8 | 2.6 | 2.8 | 2.6 | 2.8 | 2.8 |
| Max. width | *c.*1 | *c.*0.9 | 0.9 | - | - | - | 0.8 | 1.4 | 0.8 | 1.1 | 1.0 | 0.8 | 1.0 |
| Outer post setting | - | - | - | [805] | [800] | [797] | - | - | - | - | - | - | - |
| depth | 1.1 | 1.25 | >0.5 | 0.7 | 0.65 | 0.75 | 0.6 | 0.45 | 0.6 | 0.6 | >0.7 | - | - |
| diameter | 0.5 | 0.5 | n/a | 1.0 | 0.9 | 0.9 | 0.6 | - | - | 0.75 | - | - | - |
| Inner post setting | - | - | - | [804] | [801] | [795] | - | - | - | - | - | - | - |
| depth | 0.85 | 0.8 | >0.5 | 0.9 | 0.85 | 0.7 | 0.6 | 0.6 | 0.6 | 0.8 | *c.*1.2 | 0.75 | 0.75 |
| diameter | 0.7 | 0.7 | n/a | 0.8 | 0.9 | 1.0 | 0.75 | - | - | 0.65 | - | 0.5 | 0.5 |
| Outer post | [576] | [514] | [526] | - | - | - | - | - | [578] | [808] | [616] | - | - |
| depth | 0.4 | 0.35 | 0.1 | - | - | - | - | - | 0.4 | 0.5 | *c.*0.4 | n/a | n/a |
| diameter | 0.3 | 0.2 | 0.3 | - | - | - | - | - | 0.2 | 0.2 | *c.*0.25 | 0.3 | 0.25 |
| Inner post | [709] | [513] | [518] | - | - | - | [672] | - | [580] | [812] | [592] | [566] | [654] |
| depth | 0.4 | 0.1 | 0.5 | - | - | - | 0.25 | - | 0.25 | 0.65 | >0.3 | 0.3 | 0.35 |
| diameter | 0.3 | 0.2 | 0.3 | - | - | - | 0.2 | - | 0.2 | 0.2 | *c.*0.25 | 0.2 | 0.35 |
| Sections | 295 | 295 | 221 | 359 | 358 | 352 | 282 | 234 | 243 | 367 | 266 | 276 | 276 |
| | 328 | 328 | | | | 353 | 288 | 288 | | | | | |
| *Slot no.* | *[F874]* | *[F877]* | *[F878]* | *[F565]* | *[F666]* | *[F875]* | *[F494]* | *[F531]* | *[F842]* | *[F858]* | *[F727]* | *[F705]* | |
| *Slot fill* | - | - | - | *[564]* | *[667]* | - | *[493]* | *643/4* | *[843]* | *[856]* | *[768/70]* | *[706/34]* | |
| Max. length | - | - | - | *c.*1.6 | 2.4 | - | 1.7 | 2.3 | - | >0.9 | 2.5 | 2.3 | |
| Max. width | - | - | - | *c.*0.85 | 1.0 | - | 0.7 | 0.9 | - | 0.7 | 0.7 | 0.9 | |
| Outer post setting | - | - | - | - | - | - | - | - | - | - | - | - | |
| depth | - | - | - | >0.4 | 0.5 | - | - | 0.95 | - | >0.9 | 1.05 | 0.75 | |
| diameter | - | - | - | - | 0.75 | - | - | 0.8 | - | 0.7 | 0.5 | 0.55 | |
| Inner post setting | - | - | - | - | - | - | - | - | - | - | - | - | |
| depth | - | - | - | >0.45 | 0.6 | - | - | 0.95 | 0.6 | - | 1.05 | 0.9 | |
| diameter | - | - | - | - | 0.75 | - | - | 0.75 | 0.7 | - | 0.3 | 0.6 | |
| Outer post | [537] | [586] | [612] | [511] | [560] | [394] | [491] | [534] | - | [857] | [771/2] | [697] | |
| depth | 0.4 | 0.3 | 0.35 | 0.4 | 0.3 | 0.35 | 0.25 | 0.5 | - | >0.75 | 1.05 | 0.7 | |
| diameter | 0.25 | 0.3 | 0.3 | 0.25 | 0.2 | 0.15 | 0.2 | 0.25 | - | 0.25 | 0.2 | 0.3 | |
| Inner post | [539] | [584] | [610] | [562] | [558] | [556] | [489] | [532] | - | - | [765/6] | [698] | |
| depth | 0.3 | 0.35 | 0.45 | 0.45 | 0.25 | 0.4 | 0.25 | 0.8 | - | - | 1.05 | 0.95 | |
| diameter | 0.25 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.25 | - | - | 0.25 | 0.3 | |
| Sections | 229 | - | - | - | 297 | 281 | 198 | 247 | 372 | 377 | 346 | 323 | |
| | | | | | | | 199 | | | | | | |
| | | | | | | | 200 | | | | | | |